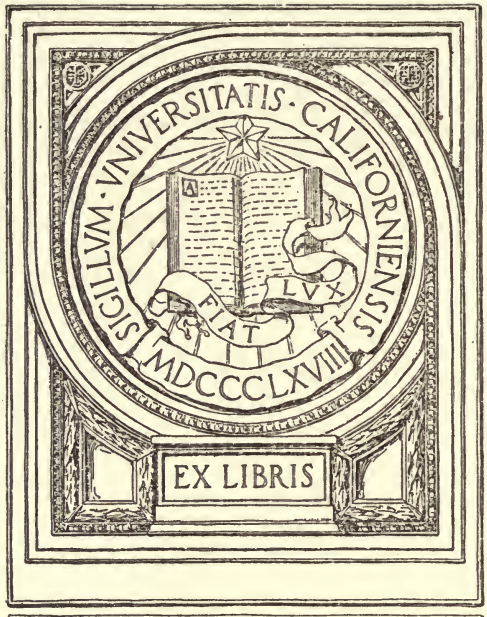
UC-NRLF
$B 68 779

The Indiana Weed Book

BLATCHLEY


SIGILLVM · VNIVERSITATIS · CALIFORNIENSIS
LVX
FIAT
MDCCCLXVIII
EX LIBRIS

The Indiana Weed Book

By W. S. BLATCHLEY

Author of "Gleanings from Nature," "A Nature Wooing," "Boulder Reveries," "Woodland Idyls," "The Coleoptera of Indiana," etc.

"Up there came a flower,
The people said, a weed."
—*Tennyson.*

Second Edition

1920

INDIANAPOLIS:
The Nature Publishing Company

SB612
I6E6
1920

"If I knew
Only the herbs and simples of the wood,
Rue, cinquefoil, gill, vervain and agrimony,
Blue-vetch and trillium, hawkweed, sassafras,
Milkweeds and murky brakes, quaint pipes and sundew,
And rare and virtuous roots, which in these woods
Draw untold juices from the common earth,
Untold, unknown, and I could surely spell
Their fragrance, and their chemistry apply
By sweet affinities to human flesh,
Driving the foe and stablishing the friend—
O, that were much, and I could be a part
Of the round day, related to the sun
And planted world, and full executor
Of their imperfect functions.
But these young scholars, who invade our hills,
Bold as the engineer who fells the wood,
And travelling often in the cut he makes,
Love not the flower they pluck, and know it not,
And all their botany is Latin names."—*Emerson.*

12/20/21

Copyright, 1912.
By W. S. Blatchley.

"How ineffably vast and how hopelessly infinite is the study of nature! If a mere dilletante observer like myself—a saunterer who gathers posies and chronicles butterflies by the wayside for the pure love of them—were to tell even all that he has noticed in passing of the manners and habits of a single weed—of its friends and its enemies, its bidden guests and its dreaded foes, its attractions and its defenses, its little life history and the wider life history of its race—he would fill a whole book up with what he knows about that one little neglected flower; and yet he would have found out after all but a small fraction of all that could be known about it, if all were ever knowable."—*Grant Allen.*

UNIV. OF
CALIFORNIA

PREFACE.

"Tough thistles choked the fields and killed the corn,
And an unthrifty crop of weeds was borne."—*Dryden.*

Long has it been said that "An ill weed grows apace," yet few are the books that tell us how to check that growth. The wild plants which dwell most closely with us, those with which we are most familiar, are many of them "weeds," yet of them and their history we know but little. Whence came they? How did they get here? What, if any, are their uses? What is their place among other plants in the great scheme of Nature? How can we best control or get rid of them? Those are the questions which we endeavor to answer in this book on Indiana weeds.

By the U. S. Department of Agriculture it has been estimated that to crop and meadow lands weeds cause an average annual loss of one dollar per acre. As at least two-thirds of the area of Indiana is comprised of such lands it follows that the annual loss in this State is $15,509,330 from weeds alone. This great loss falls almost wholly upon the farmer, and it is for him, therefore, that this book has been especially written. In the simplest manner possible we have endeavored to describe the worst weeds of the State, show their place among other plants and give the most practicable methods for their control or eradication.

While the average farmer spends most of his years in fighting weeds, he knows too little about them. A man is not considered much of a carpenter unless he knows the different kinds of lumber and the uses to which each can best be put; nor can he become much of a printer unless he gets acquainted with the different forms of type and learns how best to set them for the most effective display. Why, then, should not the farmer strive to understand the true character of each of those plants which it is his especial duty to either cultivate or extirpate? The close study of soils, fertilizers, weeds, live stock and other factors of the farm is rapidly raising the science of husbandry to a plane where it is no longer regarded as irksome drudgery, but as one of the highest callings of a free and intellectual people. Just as the old Roman

456266

Emperor, Diocletian, was most content while fighting the weeds in his cabbage patch, so all other gardeners and farmers are performing man's noblest duty, when they are endeavoring to make two blades of grass grow where but one has grown before. And especially is this true if that one was only a weed.

Not only for the farmers but also for the schools, where the future farmers will be educated, has the book been prepared. A farm-boy and a teacher has the writer been, and knows somewhat, therefore, the needs of both. While to the minds of most people weeds and poetry may seem to have little in common, the average boy or girl of 15 or thereabouts delights in an apt quotation, a legend or a bit of history which will illuminate the subject in hand. A little poetry and folk-lore, therefore, has been added here and there to give a zest to the work. The farmer, if he be a disciple of Gradgrind and so content only with facts, can blow this off as froth and drink in only the more substantial draught which lies below.

In this connection we cannot do better than to once again quote Grant Allen, who says: "Our thoughts about nature are often too largely interwoven with hard technicalities concerning rotate corollas and pedicellate racemes; and I for my part am not ashamed to confess that I like sometimes to see the dry light of science diversified with some will-o'-the-wisp of pure poetical imagination. After all, these things too are themselves matters for the highest science; and that kind of scientific man who cannot recognize their use and interest is himself as yet but a one-sided creature, a chemical or biological Gradgrind, still spelling away at the weak and beggarly elements of knowledge, instead of skimming the great book of nature easily through with a free glance from end to end. Surely there are more things in heaven and earth than are dreamed of in Gradgrind's philosophy!"

* * *

"Wayside songs and meadow blossoms; nothing perfect, nothing rare;
Every poet's ordered garden yields a hundred flowers more fair;
Master-singers know a music richer far beyond compare.

Yet the reaper in the harvest, 'mid the burden and the heat,
Hums a half remembered ballad, finds the easy cadence sweet—
Sees the very blue of heaven in the corn-bloom at his feet."

—*Van Dyke.*

INDIANAPOLIS, INDIANA, Feb. 20, 1912.

ON WEEDS IN GENERAL.

From the day that man with a crooked stick first tickled the ground about the roots of some favorite plant which he desired to grow more rapidly, and pulled from around it other plants that it might have a better supply of air, moisture and sunshine—from that day *weeds* have existed upon the face of earth. Before that day each and every plant was on an equality, fighting its own battles in its own way, spreading far and wide by rootstocks and seed its kind, evolving year by year some property, some character which would the better enable it to succeed in the great struggle for existence. But when man for the first time began to domesticate certain plants—to help them fight the battle of life—to set off certain areas in which he wished them alone to grow—all plants which were in any way harmful to his plans he called "weeds." From that day to this he has had to fight them, and from as far back as the time of Juno—according to old Homer—whenever he begins to get the better of them

> "Old Earth perceives and from her bosom pours
> Unbidden herbs and voluntary flowers."

Many of the plants which that first gardener called weeds possessed hidden virtues, properties of excellence, which other men, far down the vista of the years, discovered. These plants they began to cultivate, to utilize, and so removed them from the category of weeds. Meanwhile some of the first of cultivated plants, when carried to other parts of the earth, have either lost those properties which rendered them useful to man or have, through a change of soil and other environment, become so successful, so aggressive, that they spread and intrude upon the areas set aside for other plants favored by man, and have become the most common of weeds. So the list of weeds is ever changing, some being added here, others subtracted there, until it is different in every country, state or nation on earth and is nowhere settled or stable.

Definition of a Weed.

As a result of the conditions stated there are many definitions of a weed, among them being:

(*a*) "A plant out of place or growing where it is not wanted."

(*b*) "A plant whose virtues have not yet been discovered."—*Emerson.*

(*c*) "An herb which is useless or troublesome and without special beauty.

(*d*) "Tobacco."

(*e*) "A plant which contests with man for the possession of the soil."

(*f*) "A useless plant growing wild, of sufficient size to be easily noticeable and of sufficient abundance to be injurious to the farmer."

(*g*) "Any injurious, troublesome or unsightly plant that is at the same time useless or comparatively so."

The reader, be he student, teacher, poet or farmer, can choose from the above definitions or others the one which suits best his own taste, fancy, belief or experience. Suffice it to say that whether a plant is a weed or no depends wholly upon the point of view. Many a plant, which is among the worst of weeds to a farmer, is to the poet or naturalist a flower of surpassing beauty. The list of Indiana weeds which follows is based upon the standpoint of the farmer, and comprises the 227 of the 2,000 and more plants growing wild in the State* which are thought to be the most harmful to his interests. During its compilation definitions (*f*) and (*g*), above given, have been the ones considered.

Those plants which have become the most common or "worst weeds" are those which have been most successful in evolving methods or properties of defending themselves against being destroyed by plant-eating animals; in devising means for ready and rapid cross-fertilization, either by wind or insects, and in providing for themselves effective means of distributing their seeds or other ways of propagation when the seeds are difficult to ripen. Under the head of the Nettle Family, in the list which follows, are mentioned some of the ways by which plants defend themselves from browsing animals. The ox-eye daisy and related weeds of the Compositae Family have been most successful in devising methods for fertilization of a large number of flowers in a short time by insects, while the grasses and plantains are adepts in producing means for wind fertilization.

*Of these, 1,783 are listed in Stanley Coulter's "Catalogue of the Flowering Plants and Ferns and Their Allies Indigenous to Indiana," published in 1899. In various papers published since that date in the Proceedings of the Indiana Academy of Science, 177 additional species have been recorded.

Distribution of Weed Seeds.

Our worst weeds are in general those which have devised the most successful ways of distributing their seeds to fields and pastures new, where the competition will not be so great as in the immediate vicinity of the parent plant. Many are the methods used and a number of agents or factors enter into this seed dissemination, chief among which are wind, water, birds, animals and man, his machinery and methods of commerce. These different methods of seed distribution should be of especial interest to the farmer, for a knowledge of them will often enable him to trace the source of some noxious migratory weed which has appeared upon his land, and will cause him to be on the lookout for it from the same or similar origin. Moreover, some of the factors of seed distribution are partly or wholly under his control, while others, such as water and wind, are wholly beyond his power to lessen.

Seeds carried by wind.—The wind is one of the most potent factors in the wide distribution of weed seeds. Many weeds, as those of thistle, dandelion, fireweed, prickly lettuce, etc., have each seed enclosed in a little case to the top of which is joined a tuft of downy hairs, thus enabling them to be lifted and carried several miles by the wind; in the case of the milkweeds the tuft is attached to the seed itself. Some of the grasses have long hairs upon the chaff surrounding the grain, which serves the same purpose, while some of the docks, the actinomeris and others have the seeds or achenes winged or expanded on the sides so that they are easily lifted and borne onward by a passing breeze. (Fig. 1, *a* and *f*.)

The seeds of many weeds are blown long distances over the surface of snow, ice or frozen ground. The ragweeds, velvet-leaf, docks, pigweeds, chickweed and different weeds of the grass family are examples of those whose seeds are so distributed.

Some plants after ripening their seeds are broken off near the ground and rolled over and over by the wind, the seeds dropping off at intervals along the way. These "tumble-weeds" as they are called, include our Indiana weeds known as old-witch grass, Russian thistle, two species of amaranth and the buffalo bur, besides a number of others.

Seeds carried by water.—Water is an important agent in the dispersion of the seeds of many weeds, especially those which grow in flood plains or along the banks of streams. The great ragweed, smartweeds, bindweeds and others depend largely upon the annual overflows for the wide spreading of their seeds. The seeds

of many weeds growing on uplands are continually being washed down the slopes into lowland soils where many of them germinate and flourish. So long as careless farmers on the higher grounds allow the seeds of noxious weeds to ripen, just so long will the farmers on the lowlands have weed seeds scattered over their fields by countless thousands. Many weeds bearing ripened seeds and growing along the banks of streams are washed bodily into the current when the banks cave off, and are carried for miles down stream, finally lodging in bed of silt or bottom field, in soil well suited to the future plant.

Birds as seed carriers.—The berries or seed pods of certain weeds are eaten by birds for the nutriment found in the outer pulp and the hard seeds pass undigested. The nightshades, poison ivy, pokeweed, blackberry and pepper-grass are some weeds whose seeds are thus distributed. The seeds of thistles, ragweeds, dandelions, knot-grass and other weeds are often eaten in such quantities by sparrows and other birds that many of them are doubtless undigested and are distributed in new localities.

Water birds often carry seeds long distances in mud which has become encased or hardened on their feet. Darwin, in his "Origin of Species," states that he took in February, 3 tablespoonfuls of mud from 3 different points beneath water on the edge of a little pond. This mud, when dried, weighed only $6\frac{3}{4}$ ounces and in the viscid state was all contained in a breakfast cup. He kept it in his study for six months, pulling up and counting each plant as it grew; the plants were of many kinds and were altogether 537 in number. It is very easy, therefore, for birds to distribute many seeds in this way.

A bird also sometimes catches up a sprig of a plant and carries it where the seeds can be eaten without molestation, the act resulting in a wide scattering of the seed.

Animals as seed carriers.—Many weeds have developed spines or small hooks on their seeds or seed vessels by which they become attached to the fur of every passing animal, and especially to the wool of sheep, manes of horses and clothing of man, and are then borne far and wide before being dislodged. Thus we have the burs of burdock, cocklebur and bur-grass; the hooked achenes of the buttercups; the barbed hairs of the fruits or seed vessels of wild carrots; the prickly nutlets of hound's tongue and beggars' lice; the bristly pod-joints of the seed-ticks or tick-trefoils and the barbed achenes of the bur-marigolds, beggar-ticks and Spanish needles. The seeds of the mustards, when moistened, exude a mu-

cilage which causes them to adhere to every passing object. Live stock taken from one farm or one locality to another often carry many of these seeds or burs in wool, manes or tails, and many a clean farm has from this cause suddenly produced crops of weeds whose origin doubtless puzzled and dismayed the owner. The parts of seeds or fruits which have been evolved as clasping organs are thus seen to be varied in form and structure, but each has enabled the plant to which it belongs to migrate time and again to a new home where it could the better fight the battle of life.

MAN AS AN AGENT OF SEED DISTRIBUTION.—The plants which have become the most successful weeds of the farm have had their seeds spread more widely through the agency of man than through all other methods combined. His roads and trails wind everywhere

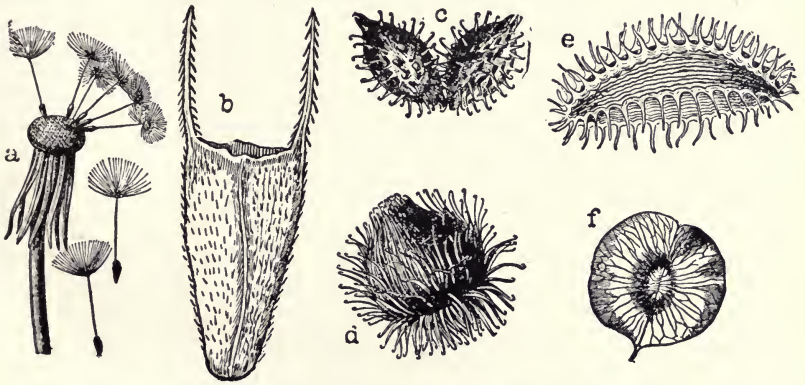


Fig. 1. Illustrating methods of seed distribution: *a*, seeds (achenes) of dandelion with pappus attached, several of them still borne on the *receptacle; b*, fruit of beggar-ticks showing the barbed awns; *c* and *d*, *burs* or fruits of cocklebur and burdock, showing the grappling appendages; *e*, fruit of wild carrot, showing the clutching spines; *f*, winged fruit of wafer-ash. (After Kerner and Beal.)

through plain and forest; his railway lines bind every State together and connect with steamship lines from across the seas, and along all these avenues of commerce weed seeds are constantly travelling, sometimes as paid passengers in company with grain and other farm seeds, but more often as hoboes in hay, bedding, packing, shipments of fruit, etc.

The great east and west trunk lines of railways are responsible for the wide distribution of many a weed, such as the Russian thistle, prickly lettuce, Canada thistle and Texas nettle, which first appear in any locality along a railway. The seeds are carried either in the coats of cattle or sheep, in the hay which supports them on their journey, or in the bedding on the floor of the car. Dropping at intervals all along the line the seeds find excellent

beds in the bared soil along the tracks where they sprout and grow until ready to take another step in advance. The botanist has learned their ways of migration and knows that if he wishes to find new and interesting species his best pathway will be alongside the railways.

Many seeds are introduced in the packing about crates of china or glassware, shipments of nursery stock and in baled hay. Many more are distributed by being mixed with commercial seeds, such as those of clover, wheat, flax and grasses.

On his harrows, plows and cultivators the farmer often carries pieces of rootstocks, bulbs, etc, from one field or farm to another. Perennial weeds such as couch-grass, trumpet-creeper, bouncing bet, bindweed and ox-eye daisy are the ones most generally scattered in this manner. Wagons, self-binders and especially threshing machines are responsible for the distribution of many weed seeds which are jostled from them as they pass along the roadways or over the fields from farm to farm. Many a well managed farm often becomes infested with noxious weeds in this way. Barnyard manures, and especially manures hauled from cities and towns where much of the feed-stuffs have been purchased from a distance, are also active agents in the spread of weed seeds.

The above are some of the indirect ways in which man has brought about the wide distribution of noxious weeds. He is also directly responsible for the spread of many weeds by introducing them into his gardens or fields, cultivating them for a time and then allowing them to escape. Such well known weeds as wild garlic, purslane, tansy, bouncing bet, oxe-eye daisy, chicory, wild carrot, butter and eggs, catnip and motherwort have been widely spread in this way. Suffice it to say that many of our most common weeds are those which have been introduced directly or indirectly by man into some locality, have there been allowed to grow for a few years in his cultivated fields or under his care, and have thus become acclimated and better adapted for a wide and successful migration throughout the land.

Those weeds which are most common and successful in cultivated fields are in general those which by reason of a quick growth are enabled to produce and ripen an enormous number of seeds. Careful estimates made by the Iowa and Kansas Experimental Stations show that the number of seeds produced by a single average full grown specimen of 15 of our most common weeds is as follows:

Crab-grass	89,600	Velvet Leaf	31,900
Yellow Foxtail	113,600	Purslane Speedwell	186,300
Pigweed	85,000	Dandelion	1,729
Tumble-weed	14,000	Ragweed	23,100
Purslane	69,000	Cocklebur	9,700
Pepper-grass	12,225	Beggar-ticks	10,500
Charlock	9,900	Ox-eye Daisy	6,750
Shepherd's Purse	17,600		

Weed Communities or Associations.

Many weeds, like misery, love company. Certain species when they travel go together and settle down in a little community on a tract of land having an environment especially suited to their taste and manner of growth. Thus along roadsides and cow-paths one finds the knot-grass, black medic, wire-grass, dog-fennel, ribwort and prickly sida; in barnyards the jimson-weed, motherwort, burdock, catnip, water-pepper and yellow dock; in lawns and country yards the dandelion, common plantain, shepherd's purse and round-leaved mallow. The most of these are so-called "social weeds," forming company not only for themselves but for man and accompanying him everywhere in his march across the continent. On the half-barren slopes of old fields there usually occurs a little community made up of the evening primrose, mullen, field sorrel, pennyroyal, cinquefoil, steelweed and ox-eye daisy, with usually a few blackberry briers and a clump of fragrant everlasting to bear them company. In rich soil along the borders of upland thickets occurs the figwort, ground ivy, blue lettuce, wood nettles and trefoils; in open woodland pastures, the common thistle, iron-weed, actinomeris, pokeweed, hawkweeds and Indian tobacco; on river banks, especially near towns, the white sweet-clover, bouncing bet, teasel, wormseed, milkweed, and prickly lettuce; while in rich alluvial lowlands grow the great horse-weed, willow aster, cocklebur, bindweed, smartweed and wild sweet potato. Numerous other plant associations could be mentioned but the above are more than sufficient to show that weeds are gregarious and that those which have similar tastes tend, like birds of a feather, to flock together.

The Origin of Indiana Weeds.

Having noted the various ways in which weeds are distributed over the earth it is not surprising to find that in Indiana the great majority of our very worst weeds are aliens from a foreign shore. They are the ones which have succeeded best in crowding out and

displacing our wild and cultivated native plants and in taking, if unmolested, complete possession of the soil. Most of these foreign weeds possess that "ingrained coarseness, scrubbiness, squalor and sordidness, that stringiness of fibre, hairiness of surface or prickly defensive character" which marks them as masters of the plant world, as weeds par excellence.

Of the 150 species of plants which are hereafter listed as being most harmful to the farmers of the State, 77 are natives of Indiana, that is, indigenous to her soil, while 73 are introduced species. Of the latter 58 came from Europe, 2 from Asia, 8 from tropical America and 5 from the plains of the Western States.

These 150 weeds are grouped in 3 classes. Class I. comprises our worst weeds, those which are fighters from start to finish, not only holding the soil in which they grow but ever striving to gain a hold on new territory. Of the 150, 46 belong to this class, and of the 46, 34 are introduced and only 12 are native to the State. Of the 34 foreign species 27 came from Europe, 2 from Asia, 4 from tropical America and 1 from the West.

Class II. comprises those weeds which are less aggressive, but are yet annoying to the farmer and the gardener. All have a weedy character and many of them seem to be waiting only for the proper conditions to arrive before jumping over the line into Class I. This Class is evenly divided, 32 species being introduced and the same number native to the State. Of the 32 outsiders, 24 are from Europe, 4 from tropical America and 4 from the West.

To Class III. belong those weeds which in Indiana occupy for the most part waste farm lands, rarely encroaching upon cultivated fields, or if they do being easily subdued by hoe or scythe. A number of them yield more or less forage for grazing stock, while some are cut for hay when other crops are short. Of the 40 species belonging to this group 33 are native to our soil while 7 came from Europe.

It must be borne in mind that this grouping is only from the view-point of the writer, based upon long observation of the weeds of the State. The reader may, from personal experience, have a widely different opinion as to which class a certain weed should be assigned. Moreover, this grouping refers only to the weeds of Indiana. Some of those in Class III. are doubtless members of Class II. or even I. in other States, while some of the worst of Class I. may there do little harm.

In addition to the 150 weeds listed and described, 77 others are, in their proper order, mentioned and briefly characterized.

They are closely related to or sometimes only varieties of those described, and the differences in habits being small and remedies for eradication practically the same, space was not taken for their more extended mention. Some of them, however, are bad weeds, 9 belonging to Class I., 36 to Class II. and 32 to Class III. Of the 77, 31 are introduced and 46 native to Indiana, 7 of the 9 worst ones being foreigners.

If to the 46 worst weeds listed we add the 9 briefly characterized, we have in the State 55 of the most aggressive of weeds. Of these 41, or 75 per cent., are of foreign origin. About the same proportion of alien weeds is seen by anyone who travels through the Eastern States. In fact, America seems to be not only the "home of the oppressed of all nations" but her soil seems to suit exactly those weeds which are the offscourings and refuse of civilization in all countries. As Grant Allen has well said: "In civilized, cultivated and inhabited New England, and as far inland at least as the Mississippi, the prevailing vegetation is the vegetation of Central Europe, and that at its weediest. The daisy, the primrose, the cowslip and the daffodil have stayed at home; the weeds have gone to colonize the New World. For thistles and burdock, dog-fennel and dead-nettle, hound's tongue and stick-seed, catnip and dandelion, ox-eye daisy and cocklebur, America easily licks all creation. All the dusty, noisome and malodorous pests of all the world seem there to revel in one grand congenial democratic orgy."

How Weeds Lessen the Output of the Farm.

The greatest question on earth to-day is, How long will the soil feed the human race? Any factor which will serve to increase that time, even in small degree, is of great economic importance. The population of Indiana is ever increasing. The number of acres of land within her bounds will be the same as long as those bounds remain as they are. To increase the output of the land and make the gain in yield of farm products to some extent keep pace with the increase in population is at present the leading problem which the more intelligent farmers of the State are trying to solve. One of the greatest factors in this problem is that of weeds. It is a self-evident fact that in all parts of the State they are in many ways a source of constant and heavy loss in the output of the farm. Some of these ways are briefly set forth in the following paragraphs:

a. They rob the soil of much of that plant food so necessary to the proper growth of cultivated crops. As a single example of

this robbery it has been shown by the Massachusetts Experiment Station that "one ton of ox-eye daisy withdraws from the soil 25 pounds of potash, 8.7 pounds of phosphoric acid, 22 pounds of nitrogen and 26 pounds of lime. To restore the stated amounts of the first three constituents to the soil it would be necessary to apply about 50 pounds of muriate of potash, 65 pounds of superphosphate and 140 pounds of nitrate of soda."* It will thus be seen that this, as well as all other weeds, feed upon precisely the same foods as do wheat, corn and other cereal crops. They deprive the crop with which they grow, or one which will come after it, of exactly the same amount of plant food as they withdraw,

Fig. 2. Mixture of weed seeds commonly found in low-grade alsike clover seed: *a*, alsike clover; *b*, white clover; *c*, red clover; *d*, yellow sweet-clover; *e*, Canada thistle; *f*, dock; *g*, field sorrel; *h*, buckhorn; *i*, rat-tail plantain; *k*, lamb's-quarters; *l*, shepherd's purse; *m*, dog-fennel; *n*, scentless camomile; *o*, white campion; *p*, night-flowering catch-fly; *q*, ox-eye daisy; *r*, small-fruited false flax; *s*, cinquefoil; *t*, two kinds of pepper-grass; *u*, catnip; *v*, timothy; *x*, chickweed; *y*, Canada blue-grass; *z*, clover dodder; *1*, mouse-ear chickweed; *2*, knot-grass; *3*, tumbling pigweed; *4*, rough pigweed; *5*, heal-all; *6*, lady's thumb. (After Hillman.)

and if allowed to grow with other crops will take their due proportion of any fertilizer that may be applied.

b. They rob the soil of moisture which they waste by evaporation, thus increasing the evil effects of droughts.

c. They crowd out and shade cultivated plants, thus greatly decreasing the yield of the latter. Most weeds have better developed roots which penetrate to a greater depth than those of the plants with which they grow. They therefore gather food and moisture more readily and usually soon out-top many crops, shutting out the sunlight so necessary to perfect maturity of the cultivated plants.

*Far. Bull. No. 103.

d. They increase the cost of any crop not only by taking the time of labor to keep them in subjection, but by retarding, especially in cereal crops, the work of preparing the ground, seeding, harvesting, threshing, cleaning the grain and marketing the output.

e. They cause a greater wear and tear on farm machinery, especially mowers, binders and threshing machines, often causing them to clog and break.

f. They frequently necessitate an unprofitable change in the rotation of crops, causing the farmer to produce some crop of little profit in order the more quickly to get rid of a certain weed.

g. Some weeds such as corn cockle and wild garlic are especially injurious to wheat, as when ground with it they render the flour poisonous and unpalatable. Others, as buckhorn, dodder and field sorrel, produce seeds which are very difficult to separate from the seeds of clover, thus greatly increasing the cost of the latter.

h. Very few weeds furnish pasture or food for stock and some of them, as the water hemlock, sneezeweed, etc., are very poisonous when eaten by them. The burs of others are very annoying in wool, the manes of horses or the tails of horses and cattle.

i. Weeds such as the nightshades, water hemlock, bitter sweet, pokeweed, jimson, etc., often cause the death or serious illness of children.

j. Many weeds furnish food or hibernating places for injurious insects. Examine carefully the winter rosettes or root-leaves of a mullen, or note the melon lice on shepherd's purse and peppergrass, and be convinced. Others are propagating plants for rusts and mildews which attack vegetables and small grains of many kinds.

k. Finally most weeds are unsightly objects, being at some or all stages of their existence eyesores whose presence not only indicates a negligent and slovenly farmer but damages the appearance and lessens the value of any land which he may wish to sell.

Benefits of Weeds.

To the practical farmer, who delights in a highly productive and clean farm, weeds offer apparently little of value to offset their many disadvantages. Yet they possess some virtues and are not to be considered wholly as enemies.

When plowed under they of course add some humus and fertility to the soil, while if allowed to grow after a crop has been harvested they shade the ground thus conserving many forms of

plant food. Their greatest benefit, however, lies in the fact that they induce frequent and thorough cultivation of the soil, thus increasing largely the output of any crop which may be grown. On this point L. H. Bailey maintains: "That weeds always have been and still are the closest friends and helpmates of the farmer. It was they which first taught the lesson of the tillage of the soil, and it is they which never allow the lesson, now that it has been partly learned, to be forgotten. The one only and sovereign remedy for them is the very tillage which they have introduced. When their mission is finally matured, therefore, they will disappear, because there will be no place in which they can grow. It would be a great calamity if they were now to disappear from the earth, for the greater number of farmers still need the discipline which they enforce. Probably not one farmer in ten would till his lands well if it were not for these painstaking schoolmasters, and many of them would not till at all. Until farmers till for tillage's sake, and not to kill the weeds, it is necessary that the weeds shall exist, but when farmers do till for tillage's sake, then weeds will disappear with no effort of ours."

The Weeds of Cities and Towns.

Weeds are not only a curse to the farmer but the city resident is also greatly troubled with them. Many an hour does he spend on his lawns, grubbing dandelions and other pests which are fighting the blue-grass, while in his alleys and backyards many an unsightly species is constantly attempting to grow and ripen its seeds. In all cities, and especially in and about country towns, there are numerous vacant lots and commons which each year produce nothing but a big crop of the vilest of weeds. The largest patch of Canada thistle which the writer ever saw was on one of these waste places in the city of Indianapolis. Prickly lettuce and sow-thistles, cockleburs and horse-weed, burdock and bull thistles, spiny amaranth and pigweed, dog-fennel and Mexican tea, sweet-clovers and wild mustard, jimson-weeds and wild carrots grow rankly on these lots and form dense thickets through which a person can scarcely force his way. Being for the most part level these city or town lots have at some time been cultivated and the original growth of grass and trees removed, leaving a surface excellently adapted to these worst of migratory weeds. Their seeds are introduced in many ways, more easily indeed than in the open country, for here rubbish of all kinds is dumped, such as bedding from stables and stock cars, packing from about china and glass-

ware, sweepings from elevators and grain stores and refuse from kitchens. In many instances the lots are low and the owners have them filled with the material mentioned, thus furnishing an excellent seed bed already planted for many a weed. Oftentimes these weed patchs are wholly or partly surrounded by high bill-boards, thus hiding the weeds from sight and allowing them to flourish without molestation.

These city and town weeds, as long as growing vigorously, are somewhat beneficial in that they serve to purify the air by using carbonic acid gas and throwing off oxygen. As soon as they die, however, they begin to decay and reverse this process, absorbing the oxygen and throwing off the gas, and should be at once mowed and removed. They gather dust and harbor bacteria and various injurious fungi; shade the soil and keep it damp and sour; while certain species produce great quantities of pollen which is often very irritating. Growing as they do where many children congregate, the poisonous species, such as pokeweed, nightshade and jimson are very apt to be eaten. The three-leaved ivy, with its attractive foliage and poisonous juices or exhalations, often occurs along the borders of these city lots and causes blisters on the skin of many a youngster.

Instead of raising noxious weeds these vacant lots should be put to more important uses. In most of the cities and larger towns there are many poor people who would be glad to utilize them for gardens. Such use would not depreciate their value for building purposes and would greatly lessen the cost of living of the needy and the amount necessarily bestowed in charity upon them. In many places the weeds and rubbish can be removed at a small cost, the surface leveled and sown to some perennial grass, and the plot then used as a playground for children. Such playgrounds are always welcomed in the crowded portions of the larger cities, where open places for that romping and running so dear to a child's heart and so necessary to its health, are often few or absent.

Classification of Weeds According to Life Period.

Weeds, like other plants, are grouped, according to the length of time they live, into three classes, viz., annuals, biennials and perennials.

Annuals.—An annual weed is one that rounds out its cycle of existence within a single year. Of these there are two subclasses, ordinary or "summer annuals" and "winter annuals."

Ordinary annuals spring from the seed in spring, mature, blossom and ripen their seeds before the frosts of autumn. Ragweed, foxtail, purslane and crab-grass are 4 of our worst weeds which are examples of this group. As a rule these summer annuals have small fibrous roots and produce many seeds.

Winter annuals spring from the seed in late summer or autumn, produce a growth of root-leaves before the ground is thoroughly frozen, then in early spring send up a flower-stalk and ripen their seeds usually by May or June. Shepherd's purse, pepper-grass, white-top and prickly lettuce are among our worst of winter annuals, while winter wheat and rye are cultivated examples. Some of these weeds are both winter and summer annuals, a part of the seed germinating in the spring and the flowers appearing much later in the season than those of the same species from the winter annuals.

In dealing with annual weeds the one general and obvious method is to destroy them in some manner before their seeds ripen. This can best be done by mowing, pulling, cutting with the hoe or smothering with the cultivator. If this be kept up for a few years and the work thoroughly done they will be completed eradicated from a farm. They would all be destroyed the first season were it not for the fact that the seeds of many species possess great vitality and often remain in the ground for years without impairing their power of growth. When brought close enough to the surface, if the conditions of moisture and temperature are right, they usually sprout at once. Any method of cultivation, especially in late fall or early spring, which will cause these buried seeds to germinate will thus go far towards getting rid of annual weeds, provided, of course, the young ones are killed as they appear. The young plants of ragweed, wild mustard, lamb's quarters, black bindweed and many other annuals are easily uprooted and killed by harrowing in autumn the growing crop of wheat, oats or rye with a light slope-toothed harrow. After the crop is well up, and there is no danger of covering the blades too deeply, few if any grain plants will be dragged out if the work is done when the land is in proper condition for harrowing.

Biennials.—A biennial is a two-year plant, that is, one which springs from a seed and spends the first season in storing up a supply of nourishment in a large root or tuber, this being used the second season in promoting a rapid growth and producing flowers and seeds. Among our worst biennial weeds are the common thistle, wild carrot, mullen, burdock and hound's tongue. Bi-

ennials grow for the most part along roadsides, borders of fields and in pastures, as their roots will not withstand thorough cultivation.

Any method of destroying the root or the top of the plant before the seeds ripen will eventually get rid of this class of weeds in cultivated ground. A single mowing which is sufficient for most annuals will, however, not do with biennials, for the thick root will immediately send up new stems. In pastures and other places where cultivation is not practicable, deep cutting below the crown or bud of the root is the best method of getting rid of biennials. This can best be done with a heavy hoe or spud, the latter being a large chisel set on the end of a long handle.*

The Chisel Spud

Fig. 3.

PERENNIALS.—These are plants which spring up year after year from the same or adjacent root systems. They grow from seeds, creeping underground stems or rootstocks, or from bulbous or tap-roots. When once started they continue in the same spot or spread gradually from it in all directions. Among our worst perennial weeds which spread by rootstocks are the Canada thistle, bindweed, horse-nettle and couch-grass, while examples of those with ordinary or tap-roots are plantains, curled dock and steelweed.

Perennials are by far the most troublesome weeds to eradicate and require in some instances the cultivation of a special crop to get rid of them. Before attempting to kill out any one of them a careful study of the underground portion should be made as, until this is done, effective eradication is impossible. As the leaves, like those of all plants, are the special organs which manufacture and store food in the roots and underground stems, several successive mowings each year will so weaken the roots and stems of many perennials that they will gradually die out. The task of mowing a perennial, such as iron-weed, from a large tract several times each season is at

*In Canada and some of the northern states the spud is extensively used in effectively getting rid of many weeds, but in Indiana it seems to be almost unknown. "It consists of a light, round handle, resembling that of a broom, and of a blade shaped somewhat like that of a chisel, but more tapering from the end of the blade to the handle on which it is fitted like a common hoe. Its length is about 5 feet from end to end. The blade is about 8 inches long, 2½ inches broad at the cutting end and ⅝-inch broad at the shoulder. It should be thin, not more than ¼-inch thick at shoulder and thinning gradually to the cutting edge. In using the spud in a wheat field one walks astride a row of grain and cuts below the surface all noxious weeds within 6 feet on either side thus clearing a strip of 12 feet in width. A small file should always be carried for sharpening the blade. The spud is designed rather to maintain than to secure cleanliness, and is used most effectively to prevent the seeding of scattered winter annual and biennial plants in cultivated fields, along fence-rows and roadsides." *Shaw, 'Weeds and How to Eradicate Them.' 103–105.*

first a laborious one, but each year gradually lessens until in time it takes but a few hours, whereas at first it may have taken a week. A perennial with running rootstocks close to the surface can often be in great part eradicated by several shallow plowings and harrowings in summer, thus allowing the sun to reach and dry up the underground parts; or it may be killed by covering deeply with soil in early spring and so smothering out the perennial portion, that is, preventing it from forming leaves to store up future nourishment. Another method of dealing with perennial weeds is to crowd them out with clover, rye or some early and rapidly growing crop. Many weeds are killed out more easily in this than any other way.

General Rules for Exterminating Weeds and Keeping the Farm Clean.

1. Sow clean seed.—Examine carefully all seeds purchased, especially those of clover and grasses, to see that they do not have weed seeds mixed with them. It is far better at any time to pay a high price for clean seed than a low price for seed that will stock the farm with weeds. If the farmer cannot buy clean seed he should raise it upon a tract of ground especially prepared and kept clean for the purpose. In the list which follows a brief description of the seeds of each of the worst weeds is given. A linen tester, which costs about 40 cents, will enable one to recognize, after a little practice, 80 per cent. of the seeds of Indiana weeds. A pocket Coddington lens of one-half inch focus, costing about $1.50, is still better and will enable one to see the finer points of all seeds. These lenses can be had of the Bausch & Lomb Optical Co., Rochester, N. Y.

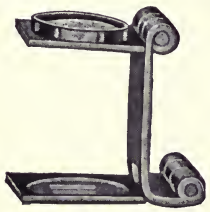


Fig. 4. Linen tester.

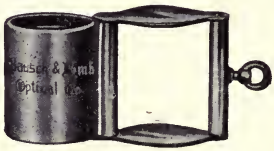


Fig. 5. Coddington lens.

2. Rotate the crops.—Too many farmers of Indiana keep on year after year "raising more corn to feed more hogs to buy more land to raise more corn," etc. Not only this, but they raise corn on the same land, especially if it be bottom ground, for 10 or more years in succession. The weeds get used to this sort of thing and know just what to expect and what to do to survive most successfully. Surprise them once by changing the program and note the

good results. A systematic short rotation of crops with regular seeding down at short intervals to grasses or clover will do more to solve the weed problem than any other rule which can be laid down. In the same way that weeds crowd out crops and reduce the yield, so may weeds themselves be choked out by these more vigorous and thickly seeded crops which will prevent them from getting light and air.

3. KEEP WEEDS FROM RIPENING SEEDS.—Each farmer owes it not only to himself but to his neighbors to obey this the "golden rule" of weed prevention. One slovenly farmer who neglects his weeds is a bane to any neighborhood, for all surrounding him must suffer for his neglect. Such a farmer lets the weeds grow and ripen on the spots in his wheat fields where the corn shocks have stood. He lets the jimson grow in the barnyard, the thistle by the roadside, the burdock in the fence corners of his orchard. Each of these weeds is a placard on which the word "s l o v e n l y" appears in autumn to every passer-by.

Nothing is truer than the old adage

"A weed that runs to seed
Is a seven year's weed."

Especially is this true of the first specimen of any strange weed that appears in a neighborhood. Then, if ever, should the old Ovidian phrase, "*Principiis obsta,*" be acted upon by the farmer. "Nip the first buddings of evil" is a free translation. Cut with a hoe or spud the stem of the stranger before it opens its bud and perchance future generations will rise up and call ye blessed. Do not think that because there are only a few weeds in a field that you can afford to let them go. Each one which seeds this year will perhaps be represented by 5,000 next year. The one can be destroyed in a few seconds, the 5,000 will require a day's hard work.

4. BURN OVER STUBBLE OR FALLOW FIELDS.—The seeds of a myriad weeds can be easily destroyed in this way. Not only future weeds but many injurious insects will also be killed. Almost any field can be burned over in autumn without much danger by running a couple of furrows around it and setting fire when the wind is not too high.

5. PLOW IN AUTUMN.—The plowing and harrowing or otherwise cultivating stubble and other fields in early autumn will cause many seeds, especially those of annual weeds, to germinate. The young weeds will mostly be winter-killed and those which survive

can be easily controlled by cultivation in early spring. The fall plowing should not be done until the land has been burned over, for weeds with ripened seeds should never be plowed under. Fall plowing is also one of the best remedies for destroying wire-worms, cut-worms, white grubs and many other larval forms of noxious insects.

6. Do away with many fences.—The removal of permanent fences from between fields and the cultivation of the ground thus redeemed will aid much in clearing the farm of weeds. Unless a large amount of stock is kept on a farm but few inside fences are really necessary. In many instances a temporary fence of wire which can be shifted from place to place can be used to control the stock. There is no more prolific breeding place for many noxious weeds than along the fence-rows of cultivated fields. Especially is this true of the old Virginia rail fences. Many a plant destined to become a scourge to the farmer ripens its first seeds within the projecting and protecting angles of these old fences. There, safe from the plow and the hoe, the future weed succeeds in its struggle with its associates, ripens its seeds by scores or thousands and sends them forth, borne by the winds of heaven or the wings of birds to cultivated and fallow fields. Thousands of acres of the richest land in the State are rendered useless by unnecessary fence-rows. Redeem this land and do away with the seed beds of many weeds.

7. Do not attempt too much.—To use a slang expression, the average Indiana farmer, each spring, "bites off more than he can chew." He attempts, single-handed, to tend 60 or 80 acres of corn and raises more weeds than corn-stalks, whereas if he had attempted 30 or at most 40 acres his yield would have been more and of better quality. The tendency everywhere in the future will be fewer acres, bigger crops. Intensive farming of small tracts is the one principal solution of the great question: How shall the earth feed its people? Therefore break up no more acres each year than you can keep clean, and keep at keeping it clean.

8. Keep the farm machinery clean.—A threshing machine taken from one farm or one locality to another should be thoroughly cleaned before being set to work. They carry many weed seeds which are scattered along roadsides and over the fields. They should also at first be run empty for a few minutes and the seeds that are caught in the grain box destroyed. Grain sacks from other farms should be shaken over some receptacle before using.

Self binders and grain drills should also be cleaned before using, as they are apt to carry many weed seeds. Harrows and cultivators should be examined to see that no bits of the underground stems of perennial weeds are attached to them. The man with a clean farm will look after these things, for where comparative cleanliness has been once secured, "an ounce of prevention is worth a pound of cure."

9. USE SHEEP AS AN AID IN WEED FIGHTING.—There is no more efficient help in keeping down the weeds on a farm than a flock of sheep. There are few pasture weeds that they will not keep grazed down if they can get at them when they are young and on a freshly cut stubble field, where other forage is scarce, they will destroy young ragweeds and foxtail by thousands. If turned into a timothy meadow containing white-top for a few days before the hay is cut they will eat out the weed and do little damage to the hay. In a corn-field in early autumn they will destroy many weeds without injury to the ears. Where annual or biennial weeds are very plentiful on a tract of land there is no more effective way of fighting them than by growing two or three crops, such as rye and millet or rape in a single season and grazing them off with sheep. It will be necessary to have the tract divided into plots so that there may be alternation in grazing and growing. Remember the old saying "all flesh is grass" and modify it to read "some flesh is weeds," by feeding the sheep upon them.

10. INCREASE THE FERTILIZATION OR DRAINAGE.—Many weeds are soil indicators, their presence being evidence that the soil is lacking in fertility or is too wet. Such weeds are most easily controlled by changing the conditions. Thus cinquefoil, mullen and field sorrel growing together on the slope of some old field proves conclusively that the soil is half barren and should be improved by lime and fertilizer. Wet places should be drained to get rid of such weeds as sedges, spearmint and tickseeds. Proper fertilization and the raising of good crops will in many instances cause the weeds to give way wholly to field crops, as the spread of weeds is usually much more rapid on half barren lands than on rich ones. Soiling crops, or those such as rape, peas, soy beans, etc., which are cut green for feed and partly plowed under, not only aid in fertilizing the land but smother out many weeds. In Indiana in the past too much land has been devoted solely to the raising of cereals and too little to more diversified and partly fertilizing crops. Since the cereals are almost always wholly removed from the land the re-

sult has been that much of it has become impoverished and weed ridden, and is therefore cultivated at a minimum profit. Feed the crops and smother the weeds.

11. Try spraying for some weeds.—Within recent years it has been proven that many weeds, especially those with comparatively broad leaves, such as wild mustard, ox-eye daisy, white-top, horse-nettle, wild carrot, yarrow, etc., can be practically eradicated from timothy, wheat, oats and rye and from pastures by the use of chemical sprays. The success of this method depends largely upon the fact that cereals and grasses are narrow-leaved plants with a single seed leaf, whereas the weeds mentioned and many others are broad-leaved plants with two seed leaves. This fact enables one to use the chemical for weed killing without much injury to the cereals or grasses.

The three spray solutions most used and the quantity applied are: (*a*) Iron sulphate (copperas) solution, formed by dissolving 100 pounds of copperas in 50 gallons of water and used at the rate of 50 to 60 gallons per acre. A granular form of iron sulphate can at present be bought for $8 to $10 per ton. (*b*) Copper sulphate (blue vitriol) solution, containing 8 to 10 pounds of blue vitriol dissolved in 50 gallons of water and applied at the rate of 40 to 50 gallons per acre. The vitriol in barrel lots of 480 pounds costs 5 to 6 cents per pound. (*c*) Common salt solution, containing 3 pounds of salt to the gallon of water and used at the rate of 50 to 60 gallons per acre. A barrel of salt, 280-300 pounds, costs about $1.15.

For spraying large tracts a good spraying machine of considerable force is necessary, while for small areas hand or knapsack sprays may be used. Both should have good spray nozzles which will deposit the solution as a fine mist upon the leaves of the weeds. Special weed-spraying outfits are now on sale in almost any large city. The following directions, as given by the Wisconsin Experiment Station for spraying oat fields with a solution of iron sulphate for the killing of wild mustard, will apply to the treatment of almost any grain or grass field:

"The spraying should be done on a calm, bright day, after the dew has disappeared, as the work is more effective if the solution is put on in the warm sunlight. When rain follows the spraying within a few hours the extermination of the mustard will not be complete.

The grain fields should be sprayed when the mustard plants are in the third leaf, or before the plants are in blossom, in order to have the spray do the most effective work. The day following the spraying the tips of

the blades of the grain may be somewhat blackened but no detrimental effects can be noticed, either to the crop or grasses seeded with it, two weeks after spraying.

Daisies, cocklebur, bindweed, ragweed, chicory, sheep sorrel, yellow dock, wild lettuce and many other weeds were partially or wholly eradicated from the fields where tests were made for the extermination of mustard."

In Ohio Selby has found the common salt solution best for dandelions, Canada thistle, poison ivy and horse nettle, and either the iron sulphate or salt solution effective on timothy meadow weeds such as wild mustard, white-top, yarrow, etc. The copper sulphate solution is poisonous to stock and should therefore not be used in pastures. The use of sprays for weed killing has not yet passed the experimental stage, but enough has been done to prove its effectiveness on the worst weeds of meadows, pastures and roadsides.

The application of salt, coal-oil or some acid to the roots of perennial weeds immediately after they have been cut close with scythe or hoe has proven effective in many instances. In pastures, where salt alone should be used, the stock often aid materially in keeping down the weeds, by attempting to secure the salt from about the roots.

12. PROTECT THE SEED-EATING BIRDS.—Were it not for the aid given him by seed-eating birds the subjugation of many of our worst weeds would be for man a hopeless task. Each fall and winter they flock by thousands to the farms and gardens and live upon the ripened seeds of weeds. The birds which are most beneficial as seed eaters are the sparrows and finches of the family Fringillidæ, 38 of which are known to occur in Indiana, 17 of them being found here in winter. The chief character which distinguishes this family is a thick, cone-shaped bill which is shorter than the head and abruptly angulated or drawn down at the corners of the mouth. With this they can crack the hard outer shell of most of the smaller seeds and feed upon the rich nutritious kernels within.

Two of the most common and most beneficial of the sparrows which winter with us are the tree sparrow and the junco or snowbird. These two nest far up in British America but arrive in numbers from the north about mid-October and remain till April 1st or later. They live almost wholly upon the seeds of such annual weeds as foxtail, ragweed, smartweed, bindweed, crabgrass and pigweed. Prof. F. L. Beal of the U. S. Department of Agriculture examined the stomachs of many tree sparrows, finding

Fig. 6. Weed seeds commonly eaten by birds: *a*, bindweed; *b*, lamb's quarters; *c*, purslane; *d*, pigweed; *e*, spotted spurge; *f*, ragweed; *g*, foxtail; *h*, dandelion. (After Judd.)

them entirely filled with weed seeds. He estimated that each bird consumed at least a quarter of an ounce of such seed daily. Making a fair allowance for the number of tree sparrows to the square mile, he calculated that in the State of Iowa the tree sparrow alone destroys each winter about 1,750,000 pounds or 875 tons of weed seeds. In the stomach of a single one of these birds was found at one time 700 seeds of foxtail.

All the sparrows deserve the especial protection of the farmer as they feed not only upon weed seeds in autumn, winter and early spring, but destroy many forms of noxious insects in summer. Among the most numerous and beneficial of the sparrows in Indiana besides the two mentioned are the goldfinch or thistle bird, the field, fox and song sparrows, the chewink and cardinal or redbird, the white crowned, white throated and chipping sparrows, the dickcissel, grasshopper sparrow and lark finch and the bay-winged and indigo buntings.

In addition to the sparrows the chief seed eating birds occurring in the State are the mourning dove, quail, blackbirds, bobolink, cowbird and horned and meadow larks. Some of these feed largely upon grain as well as weed seeds, but the good that they do far outweighs the bad. No less than 50 different kinds of birds act as seed destroyers. During cold weather they require an abundance of food to keep their bodies warm, and it is the habit of the sparrows that then flock to the weed patches to keep their stomachs and gullets heaping full. In time of deep snows, when the weeds are covered, many of them starve and then especially can the farmer reward and protect them by scattering wheat and other grain where they can easily find it.

13. MAINTAIN THE CLEANLINESS.—After a farm has once been comparatively cleared of weeds it should be kept in that condition. With the proper care this can be done with little labor and small cost. Meadows and grain fields should be gone over just before the grass or grain is ripe and all weeds such as white-top, dock, buckhorn, corn cockle, etc., pulled or cut with hoe or spud. This work should be thoroughly done so as to prevent any seeds from

ripening. If the grain fields have been seeded down to grass or clover they should be gone over a second time in September and any visible weeds removed. If fall cultivation is to be done this will not be necessary. Permanent pastures, fence-rows, borders of woodlands, roadsides and other uncultivated tracts should also be carefully looked after in late summer to prevent seeds from maturing. When a farm has once become fairly clean a farm hand should be able to go over it with hoe or spud at the rate of 10 acres a day. If the hand receives $1.50 per day and goes over a 100 acre farm twice each year, the entire cost of keeping the weeds in subjection will not be over $30 to $40 per annum. With short rotation of crops the whole farm will not have to be gone over twice, as the necessary cultivation, if properly done, will take care of the weeds in certain fields. The cost of maintaining cleanliness depends altogether on how thoroughly the work is done. If done properly both work and cost will decrease rapidly from year to year.

14. Study the weeds.—No person can successfully fight weeds or anything else without knowing the nature of that which he is fighting. Strive to learn thoroughly their methods of growth and ways of spreading. After these are known any weed on a farm can be controlled if fought constantly and in the proper manner. Remember that the weed itself has many problems to solve, many enemies to avoid. Before it can have fulfilled its mission on earth —that of producing another weed like itself—the seed whence it sprung must have escaped the attacks of birds, mice and other enemies, else it would never have become a weed. The young shoot must have escaped the hoe or scythe, the jaws of grub or locust, the maw or hoof of cattle or horse. The flowers must have opened and secured their fertilization; the fruit must have set and ripened the seeds. They in their turn must have been scattered far and wide to proper soil and place of growth. If the weed fails, no matter how little, in *any one* of these things it is lost. Its chance of reproducing its kind is gone. Take advantage of some one of these problems which the weed has to solve and prevent its solution. Know the weeds first, then knock them out.

15. Make botany a common school study.—The chief business of the farmer is to raise cultivated plants, with the leaves, the seeds or the roots of which he feeds himself and the world. True he feeds part of them to animals but—"all flesh is grass." The plant must ever precede the animal and gather from the soil for the latter the food and store from the sun for it the energy neces-

sary to its existence. Yes, farmers grow plants, but how many of them know the parts of a flower, the duties of each part? How many of them can take a book and determine for themselves the name and place of a new plant which has appeared on their farms and so know whether it is harmless or aggressive? Our most noxious, our vilest weeds can now never be wholly eradicated, but can only be subjugated and kept in partial control. They are here and here to stay. Had the farmers of the past known their real character and recognized the plants on their first appearance they would have postponed all other business until they were destroyed. As it is, the farmers of the future must wage an eternal warfare against them, for they have secured a foothold which cannot be entirely overcome. True, a new species possessing characters which will enable it to crowd them out may, in time, appear, but such a change would very likely be for the worst.

There was a time when but one, two or a dozen plants of each of these foreign weeds existed in the State. Then was the time to have successfully quarantined that species by destroying those pioneers. The few persons on whose land they appeared neglected them, and every gardener, every farmer, yea, every land owner in the State must henceforth, now and forever, pay the penalty for that neglect by continued hoeing, plowing and mowing to keep these alien weeds in subjugation. As long as the rudiments of botany are not taught in the common schools the average farmer will be unable to tell whether a new plant which has made its appearance upon his land should be allowed to grow or not; in fact, in many instances he will not know that a new plant is there until it becomes too abundant to be easily overcome. Put a high school into each township in the State; teach the elements of botany therein and then, and not till then, may we hope that the farmers of the future will be on the lookout for all new plants; will be able at once to judge their relative injuriousness, and will destroy, before they have time to ripen their seeds, those species which, if allowed to spread, will become a curse to the State.

Medicinal Properties of Weeds.

A number of our most noxious weeds possess valuable medicinal properties and have been used for centuries in the manufacture of drugs. Although the weeds so used were most of them introduced from Europe and the American farmer has had to fight some of them for nearly four hundred years, he has not been thrifty enough to gather them for the drug trade. In Europe, where

everything that can be turned into an honest penny is put to account, these weeds are gathered in large quantities and to the value of hundreds of thousands of dollars, are shipped to America each year. Here the same weeds are allowed to encumber the farm and impoverish the farmer, whereas they might be made sources of profit.

Among the more common weeds growing in Indiana which for drug purposes have a value sufficient to justify their gathering are the couch-grass, curled and broad-leaved docks, black mustard, pokeweed, wormseed, poison hemlock, pleurisy root, silkweed, Indian tobacco, catnip, mullen, two kinds of jimson-weeds, dandelion, boneset, white snakeroot, horse-weed or fleabane, elecampane, tansy, burdock and yarrow. Many a dollar can be earned by farm boys and girls in gathering and properly preparing the parts of these weeds used in medicine. Markets for them will be found at Madison, Terre Haute, Evansville, Fort Wayne, Indianapolis and other cities where buyers of roots and herbs are in business. Sulzer Bros., of Madison, who are the largest dealers in roots and herbs in the State, bought in 1911, 114,000 pounds of the medicinal parts of the above weeds, paying therefor about $3,600. The price paid for them is not large but the collecting can mostly be done in late summer at a time when farm work is not pressing. The small income thus derived will be so much gained while the farm is at the same time being cleared of the weeds. Under the name of the weed, in the list which follows, the part used of each of those above mentioned is given in proper order, and brief directions are also given for its collecting and curing. In general it may be said that whatever the parts gathered, they should be *thoroughly dried in the shade* on clean floors, racks or shelves, being spread out thinly and turned frequently. If dried out of doors they should be protected from dew at night and at all times from rain. Roots should be throughly cleaned, washed and, if too large, sliced. Much care should be taken to have all parts free from foreign matter, especially earth and fragments of other plants, and the leaves and stems, when dry, should retain their bright green color.

When ready for sale the name of the nearest dealer should be obtained and a few ounces of each part, properly labeled, sent him as a sample. State the amount on hand and how soon it can be supplied. In shipping, the crude drugs should be tightly packed in clean dry barrels or gunny sacks, and plainly marked or tagged, both with the name of the sender and the person to whom they are consigned.

Names of Weeds.

The first thing that a farmer or other person asks about any weed which attracts his attention is, "What is its name?" or "What kind of a weed is it?" In other words he wants some handle to carry it with and if no one can give him one he makes it for himself. Hence there are many common names for the same weed, sometimes half a dozen or more in the same community. This is unfortunate, for one of the most important things in the warfare against weeds is to know a weed when it is seen and call it by its true name, that is, the one by which it is most widely known. In the list of 150 Indiana weeds each one has several of these common names given after the scientific name, the one in most general use being first mentioned.

Each weed is known to botanists by one and the same scientific name and it would be well for the farmer to learn these and then there would be no mistake about the weed he has in mind, provided he has it correctly identified. Each scientific name is made up of two Latin words, the first one, always begun with a capital letter, corresponding to the surname of a man and the second one, beginning with a small letter, to his given name. Thus the scientific name of the common yellow or curled dock is *Rumex crispus* L. in which the second name, *crispus,* corresponds to the given name, as "John" or "Charles," and the first, *Rumex,* to the sur- or family name, as "Smith" or "Jones." The scientific name is therefore of the same nature as that given a man but is in Latin and is written backward, as Smith John. There may be any number of kinds of *Rumex* or docks, but there can only be one of them named *crispus,* just as in the same family we find but one John. The surname of the man who first describes a plant or weed and gives it a Latin name is always associated with it. Thus the L. after the name *Rumex crispus* L. is the abbreviation for Linnæus who was the first botanist to give scientific names to plants and who gave the Latin names to the most of our worst weeds.

The first part of a scientific name, as *Rumex,* is called the generic name, a genus being a group of kinds or species of plants which are alike in a number of characters. In this case it includes all true docks. The second name, *crispus,* is the specific name and always refers to the one kind of dock which, wherever it is found, has certain characters distinguishing it from all other kinds of *Rumex.* When one has learned to know well any one individual plant of a certain weed he is therefore also acquainted with all

other individuals of the same species. The generic and specific names given to a plant or animal usually have some well defined meaning, *Rumex* in the case mentioned meaning "a spear," from the shape of the leaves of the little sour dock or field sorrel, while *crispus* refers to the curled or wavy margins of the leaves of the curled dock which bears the name.

Parts of a Weed.

In order that the farmer or other person may be able to distinguish from the descriptions given any one of the 150 weeds listed it will be necessary for him to know the names, structure and uses of a few of the principal and more prominent parts of a weed. As all of our weeds are constructed on the same general plan the parts of one will serve to illustrate the others with only certain differences in some particulars. Let us take, therefore, the corn cockle which is a common weed in wheat fields and examine carefully its different organs and the uses to which they are put.

If an entire specimen of corn cockle be pulled up after it has been in blossom for some time it will be seen to have five general parts or divisions which are well known to all farmers. These are roots, stem, leaves, flowers and fruit or "seed pods," and they will be considered in the order mentioned.

The roots of weeds.—Roots of weeds vary greatly in form, size, length of life, etc. They grow downward or spread out below the surface thus avoiding the light. Their chief duties are to support the plant in position and to gather for it moisture and food from the soil. As already noted, the roots of annual plants like the cockle live for but a single year. They are for the most part fibrous and spreading, and annual weeds can usually be easily pulled by hand. The roots of both annuals and perennials are usually greatly divided in order to secure a firm hold upon the earth and to have as large an absorbing surface as possible in contact with the soil. In most weeds all the nourishment, except carbonic acid gas, comes from the soil and must be in liquid form before it can be taken up by the little hairs which are found in numbers upon the smaller divisions of the roots. The plant foods such as potash, phosphorus, nitrates, silica, etc., before they can be absorbed by these root hairs must therefore be dissolved in the moisture of the soil, just as we dissolve crystals of sugar or salt in water. Some roots, as those of clover and most plants of the pea family, produce small

Fig. 7. Fibrous roots of red clover showing the nitrogen storing nodules. (After Piper.)

nodules caused by bacteria. (Fig. 7.) These bacteria have the power to fix the free nitrogen of the air and develop nitrogen salts. The clover plant uses part of these nitrogen salts as food and leaves some of them in the ground. Weeds of the pea family are thus to some degree beneficial in that they help enrich the soil.

The roots of most biennial weeds, as well as those of some perennials, are often thick or fleshy, being composed largely of starch which has been stored to be used in giving the flower stems of the second or succeeding year nourishment for a quick growth in spring. Such weeds often have one large central tap-root extending straight downward, with a few smaller roots branching from its sides. The roots of a weed extend downward or outward in search of a sufficient supply of moisture; if this be lacking the weed, like all other plants, ceases growth, shrivels and in time dies.

THE STEMS OF WEEDS.—The stem is the main axis of the plant and is supposed to bear the roots below ground and the leaves and flowers above. Most stems of weeds are more or less branched, some of them very much so; if not at all branched they are called *simple*. If the stem dies down to the ground each year the plant is called an *herb,* or if it twines, an herbaceous vine. Almost all weeds are herbs. Stems with a woody texture which survive the winter above ground are woody vines, shrubs or trees. One shrub and two woody vines are included in the list of Indiana weeds, viz., the blackberry, poison ivy and trumpet-creeper, while the common elder might with propriety also have been included.

In structure stems of weeds and other flowering plants are divided into two great classes. In one class, called *endogens,* or inside growers, the woody or vascular tissue is usually scattered in bundles through the stem, and there is no visible distinction of bark, wood, etc. By cutting across the stem of a dry cornstalk one can readily find these bundles running like fibres lengthwise

through the pith. Only a few of our weeds belonging to the grass, sedge, lily and rush families have stems of this kind. In the other class called *exogens,* or outside growers, the stem is composed of distinct layers which surround one another in circles, and are usually known as bark, wood and pith. All our weeds except those of the four families above mentioned belong to this class.

The direction of growth of the stem is an important distinguishing character of weeds. If, like the corn cockle, it stands upright it is said to be *erect;* if arising obliquely from a prostrate base it is called *ascending.* Stems which grow along the ground without rooting are *prostrate* (purslane) or *trailing* (ground ivy). The stems of some weeds, as the plantain and dandelion, are very short, the leafless flower-stalk springing from the midst of a clump of basal or so-called root-leaves. Such a flower-stalk is called a *scape.*

Some perennial weeds produce both ordinary erect and creeping underground stems, the latter being called *rootstocks* or rhizomes. They may be known from true roots by their bearing buds at short intervals. When the conditions are favorable these buds produce erect above-ground stems. Such perennials are the most difficult of all weeds to eradicate. The stems of some weeds, as the cinquefoil, produce above ground and near the base *runners* or offsets which take root and form new plants.

THE LEAVES OF WEEDS.—Leaves are among the most important parts of a weed, as it is in their cells that all the food of the plant is assimilated or fitted for growth and for forming the flowers and seeds. It is the leaf also which has the sole power of absorbing carbonic acid gas from the air and by the aid of the sun's heat and light, in the presence of the green coloring matter (chlorophyll), changing it into starch, this being used in forming other tissues such as wood or seeds or tubers. In these tissues the energy from the sun's heat and light is stored and when the tissues are burned or used as food by animals the energy is set free and can be controlled by man. Most of the energy used by man and animals in performing the work of the world was at one time thus gathered by leaves and stored in the roots or stems or fruits of plants. Leaves are the principal organs of respiration or breathing which the weed possesses. It is through them also that the excess of water gathered by the roots passes off. Constituting as they thus do the organs of digestion, breathing and transpiration or sweating, it is very plain that if one can prevent a weed from producing leaves it will soon die.

The broad expanded part of a leaf is called the *blade* and the

narrower portion by which it is joined to the stem or branch is the *stalk* or *petiole.* Leaves which have no stalks, the blades being joined by one end directly to the stem, are *sessile.* In position on the stem they are *opposite* or in pairs as in the corn cockle; *alternate* or scattered singly along the stem, one above another on opposite sides, as in the mullen, or *whorled* if three or more come off in a circle at the same level.

In shape the leaves of weeds vary greatly, some of the forms being *ovate* or egg-shaped; *lanceolate,* narrower and more elongate than ovate and tapering to a point like a lance; *cordate* or heart-shaped; *reniform* or kidney-shaped, that is heart-shaped at base but broader than long and not pointed; *hastate* or halberd-shaped,

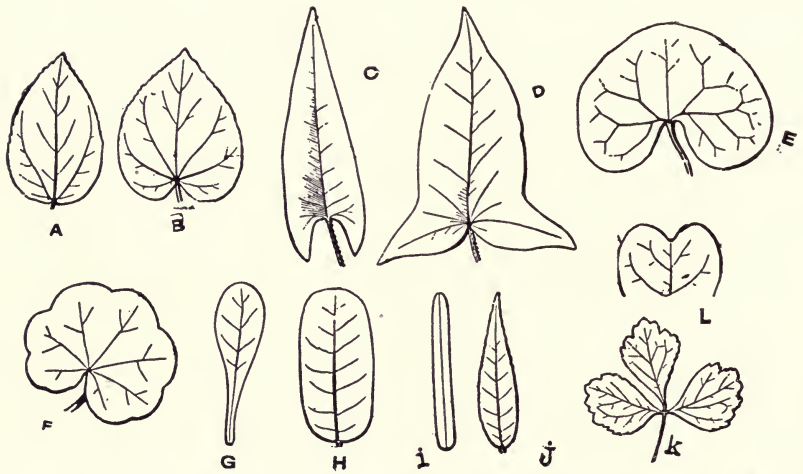


Fig. 8. Showing forms of leaves: *a*, ovate; *b*, cordate or heart-shaped; *c*, sagittate or arrow-shaped; *d*, hastate; *e*, reniform or kidney-shaped; *f*, rounded or orbicular; *g*, spatulate or spoon-shaped; *h*, oblong and obtuse; *i*, linear; *j*, lanceolate; *k*, 3-parted or 3-divided; *l*, with apex notched or emarginate. (After Gray.)

with the lobes at base pointed outward; *oblong* or narrowly ovate and usually dull at tip; *spatulate* or spoon-shaped, that is broader toward the apex; *orbicular* or rounded, and *linear* or long and narrow as those of the corn cockle. The linear leaves of endogens like grasses, sedges and lilies have only long straight parallel veins, while those of *exogens* have netted veins which interlace and run together so as to form a network. (Fig. 15 *b, d.*)

The edge or border of the leaf is either *entire* or variously *toothed, lobed* or *deeply parted.* When the lobes are divided clear to the midrib or the main vein at center, the leaf is said to be *compound,* otherwise it is *simple.* Each of the leaflets or divisions of a compound leaf may be divided into segments and these again

subdivided, as in the *dissected* leaves of yarrow, dog-fennel, etc. The tip of a leaf may be *acute* or pointed, *acuminate* or longer pointed, *obtuse* or dull, *emarginate* or notched, etc. Both leaves and stems may be clothed with hairs, as in the corn cockle, or *glabrous,* without hairs. The hairs, when present, differ greatly in length, stiffness, abundance, etc., in the various weeds.

The leaves of many weeds bear on the stalk near the base a pair of leaf-like expansions called *stipules* (Fig. 15, *d*), which are usually green but often colorless. The margins of sessile leaves may sometimes extend down along the stem as in mullen. Such leaves are said to be *decurrent* and the stem *winged. Bracts, scales, glumes,* etc., are only leaves reduced in size which are mainly used to protect the flowers. The seed leaves or *cotyledons,* are small

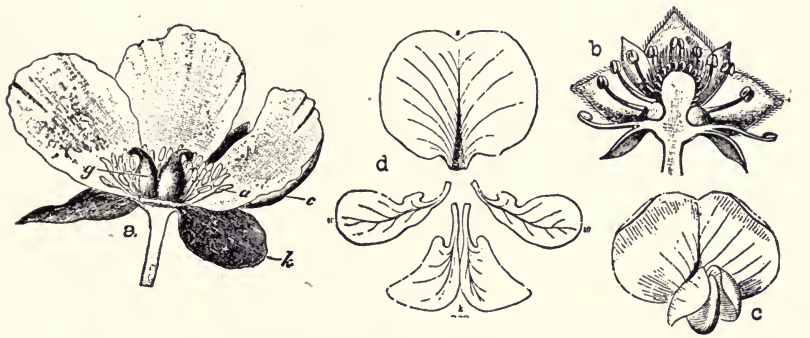


Fig. 9. Illustrating the parts of a flower: *a*, flower of poppy showing the 4 sets of floral organs, viz., *k*, the *sepals*, together called the *calyx; c*, the *petals*, together called the *corolla; a*, the numerous *stamens; g*, the 2 *pistils* which contain the ovules. *b*, Flower of cinquefoil showing 3 broad sepals, 2 smaller petals alternating with them, a group of stamens, and a large receptacle bearing numerous small pistils. *c*, Butterfly-shaped flower of sweet pea; *d*, same spread to show the parts; *s*, the *standard*, *w*, the *wings*, *k*, the *keel*. (After Strasburger and Gray.)

leaves which exist in all seeds. In some plants, as the squash and beech-nut, they arise above the ground when the seed sprouts. Endogens have but one seed leaf while all exogens have two.

THE FLOWERS OF A WEED.—The flower is that part of a plant whose chief duty it is to produce seeds or the young of future plants. A complete flower consists of the *floral envelope,* (Fig. 9, *a*), or calyx and corolla, and the *essential* or *sexual organs,* the stamens and pistils. If any one of these four divisions of a flower is absent it is said to be *incomplete.* The calyx or outer floral envelope is composed of several modified leaves called *sepals* which are usually green in color, and arranged in a circle so as to cover and protect all the other parts of the flower when in bud. In the corn cockle the lower parts of all 5 sepals have their edges united so as to form a tube, while the upper part of each sepal is separate,

elongated and pointed. In the calyx of many weeds the sepals are wholly separate and distinct one from another. In the different weeds they also vary greatly in shape, size and degree of union, so that the calyx may be shaped like a cup, bell, saucer, urn, tube and many other objects. In some weeds the calyx is colored like the corolla while in some it is wholly lacking. However, if but one set of floral envelopes is present it is the calyx, whatever its color, and the flower is said to be *apetalous;* while if both calyx and corolla are absent the flower is *naked.*

The inner floral envelope when present is called the *corolla.* It is also made up of several leaf-like parts arranged in a whorl or circle and called *petals.* The petals are usually brightly colored and larger than the sepals. They also vary greatly in the different weeds in number, form, size, color and degree of union one with

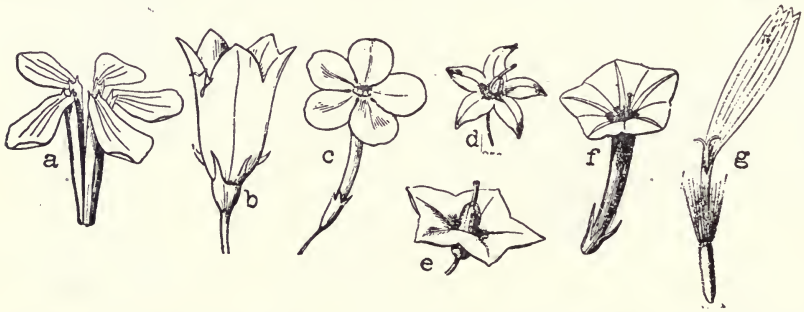


Fig. 10. Illustrating forms of corollas: *a*, *polypetalous* flower of bouncing bet showing the 5 petals with long claws or stalk-like bases; *b*, *gamopetalous* bell-shaped corolla of bell-flower; *c*, salver-shaped corolla of phlox; *d*, wheel-shaped corolla of nightshade; *e*, same of potato, the lobes less divided; *f*, *funnel*-form corolla of morning-glory; *g*, strap-shaped corolla of a Compositæ. (After Gray.)

another. In the corn cockle the petals are 5, purple-red, separate, broader and slightly notched above and narrowed into wedge-like claws below. When the petals are wholly distinct one from another the corolla is said to be *polypetalous;* when more or less united, *gamopetalous.* If the petals are all alike, as in the cockle, the corolla is *regular;* if one or more of them differ in size or shape as they do in many weeds, especially those of the pea and mint families, the corolla is *irregular.*

The form of the corolla varies much and, like that of the calyx, is often described as being bell-, funnel-, wheel-, tube-, or otherwise shaped. In the weeds of the bell-flower, mint and figwort families the corolla is more or less *two-lipped,* the petals being so united that two of them form an upper or overhanging portion, while the other three form the lower lip. In the dandelion, ox-eye daisy, dog-fennel and other weeds of the Chicory and Compositæ

families some or all of the small tubular corollas appear as if split part way down on one side and then flattened. Such a corolla is said to be *ligulate* or strap-shaped, the split portion being called a *ray.*

The corolla is often wrongly called the "flower." This is because it is usually the showy or attractive part to humans. However, it was not made handsome to attract man but insects, so as to bring about a better pollination or cross fertilization of the essential organs. It also serves to some extent to protect those organs in the bud. In endogens the sepals and petals are, when present, 3 each in number and often colored alike to form what is known as the *perianth.*

The duty of the *stamens,* or outer set of essential organs of a

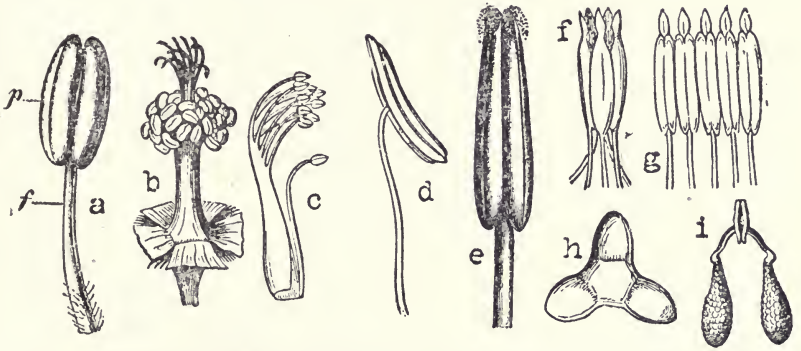


Fig. 11. Illustrating stamens and pollen grains: *a*, stamen of henbane, *f*, filament, *p*, anther; *b*, flower of mallow with calyx and corolla cut away, showing the *monodelphous* stamens united in a column around the styles; *c*, stamens of pea in two groups (*diadelphous*) 9 and 1; *d*, stamen with *versatile* anther as in grasses and evening-primrose; *e*, stamen of horse nettle, the pollen escaping by terminal pores; *f*, stamens of a Compositæ showing the anthers united in a tube: *g*, same with tube split and spread out; *h*, a 3-lobed pollen grain of evening-primrose; *i*, a pair of pollen masses of a milkweed flower attached by stalks to a gland. (After Gray.)

flower when both are present, is to produce pollen grains or spores. These grains are the male or fertilizing agents of the flower. A stamen usually consists of a stalk or *filament* and an *anther,* the latter being made up of 2 sacs or cells in which the pollen is formed and held until it is ready for use. When the pollen is ripe the sacs open by slits or pores and the pollen is scattered by the wind, insects or other agencies. The stamens vary greatly in number, length of filament, form of anther, degree of union one with another, and mode of insertion or connection with other parts of the flower. All of the filaments may be joined together as is the case in the velvet leaf and other weeds of the mallow family, or they may be united in sets as in the St. Johnswort and many plants of the pea family. In the weeds of the Compositæ family the anthers are united to form a ring about the style.

In a number of weeds, as the common ragweed and field sorrel, the stamens and pistils are borne in separate flowers. Those flowers with stamens only are called *staminate* or sterile flowers, whether the calyx or corolla be present or not, while those with pistils only are *pistillate* or fertile flowers. In the ragweed these two kinds of flowers are borne on the same plant and when so borne the plant is said to be *monœcious* (of one household). In the field sorrel they are on separate plants and in this and similar cases the weed is called *diœcious* (of two households). If both stamens and pistils are absent, as in the ray flowers of some Compositæ weeds, the flowers are *neutral*. In the corn cockle the stamens are 10 in number, separate, and borne on the stalk of the

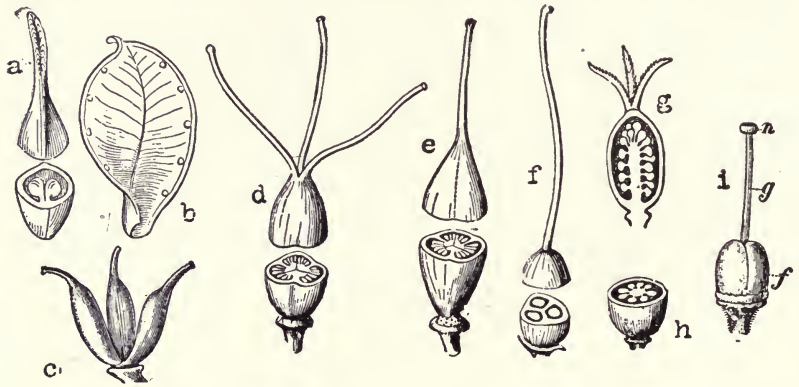


Fig. 12. Showing forms of pistils and ovaries: *a*, *b* and *c*, *simple* pistils; *a*, pistil of a single leaf, the ovary cut across with the ovules borne on the central suture; *b*, pistil of marsh marigold which has opened and shed its seeds; *c*, 3 simple pistils of one flower; *d–i*, *compound* pistils; *d*, of common St. Johnswort, showing the three separate styles and 3 cells of ovary; *e*, of shrubby St. Johnswort, showing the styles united, but the cells the same; *f*, of spiderwort showing the 3 cells each with a single ovule; *g* and *h*, of chickweed showing 3 styles, 1 cell and ovules on a central column; *i*, a pistil showing the ovary, *f*, the style, *g*, and the stigma, *n*. (After Gray.)

ovary, and the anthers open by lengthwise valves to discharge the pollen.

The *pistils,* or female parts of the flower, which produce the young or unfertilized seeds called ovules, form the innermost set of the essential organs. In number the pistils vary greatly according to the species of plant. The flowers of some plants, as those of the pea or clover, have a single simple pistil, while a buttercup has many. Such simple pistils consist of a single modified leaf, the *carpel,* folded together and containing one or many ovules. A compound pistil, as that of the corn cockle, consists of two or more carpels joined together. Each pistil is made up of two or three parts. The two parts always present are the *ovary* or enlarged part at base which contains the ovules, and the *stigma* which is

viscid or sticky so as to catch the pollen grains. Sometimes the stigma is borne directly on the ovary but more often it is at the top or on the side of a slender stalk called the *style,* which is an elongation of the upper part of the ovary. In corn the styles are very long and form the so-called "silk."

The ovary of a simple pistil when removed and cut crosswise is seen to have but a single cell or cavity to contain the ovules, while that of a compound pistil may have a number of cells, their partition walls being formed by the carpels which compose the ovary. The number of these carpels can usually be told by the number of styles or stigmas present. In the corn cockle there is one compound pistil with 5 styles, a stigma being attached along the inside of each, so that 5 carpels were united to form the pistil. When cut crosswise the ovary is seen to be only 1-celled, the carpels not having formed complete partitions or walls though traces of such walls are seen at the base. The ovules are many and are joined to a central column which extends from the bottom to near the top of the ovary. The ovules of different weeds are arranged in the cells in different ways, sometimes being joined to one or more seams (*placentæ*) on the sides of the cell and sometimes attached to a central column as in the cockle. If single they may be attached at base to the bottom of the cell.

The number of cells in the ovary is used as a very important character in distinguishing the families of plants and can usually be readily determined by carefully removing the ovary, cutting it crosswise with a sharp knife and then gently squeezing the ovules from one of the halves. By looking closely with a lens the number of small cavities can then be easily counted. (Fig. 12, *d, e, f.*) It is also important to know whether the ovary is in any way united to the calyx or not. In the corn cockle the two are wholly separate, the ovary being above the calyx, and when so placed it is said to be *superior* or *free.* In the evening primrose and many other weeds the calyx is partly or wholly united to the ovary and the latter is then said to be *inferior.*

Within each ovule is a little embryo sac containing a minute egg or germ. When a pollen grain falls on the sticky stigma it develops or sends out a very slender tube containing numerous microscopic sperm or male cells. This finds its way down through the tube of the style and entering the ovule through a minute opening empties the sperm cells into the embryo sac. One of the sperm cells unites with the egg and the fertilization of the latter results. From the fertilized egg the young or embryo plant is pro-

duced within the ovule. The coats of the latter thicken and enlarge and in time form the ripened seed which with the future weed enclosed is ready to be borne to some new spot where it may sprout and begin for itself the battle of life.

The manner of *inflorescence,* or arrangement of the flowers on the stem, is often an important distinguishing character of weeds. Flowers are either *solitary* or *clustered.* Solitary flowers are either borne in the axil or angle which the leaf makes where it joins the stem, when they are said to be *axillary* and solitary, as in the moneywort; or are borne on the ends of the stems or branches, when they are *terminal.* In the corn cockle the flowers are solitary on the ends of long axillary *peduncles* or flower-stalks. If the flower is

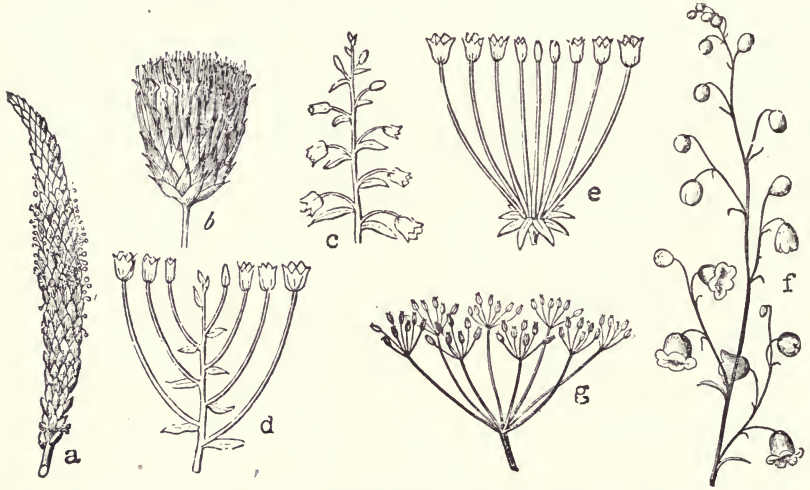


Fig. 13. Showing forms of inflorescence: *a, spike* of plantain; *b, head* of Canada thistle, ⅔ natural size; *c,* a *raceme; d,* a *corymb; e,* an *umbel; f,* a *panicle; g,* a compound *umbel* with *umbellets.* (After Gray.)

without a peduncle or stalk of its own it is said to be *sessile.* The end of each stem or peduncle which bears the flower or on which the different parts rest is the *receptacle.*

In most weeds the flowers are in clusters on the ends of the branches or stems, rarely in the axils, as in tumble-weed. In form the clusters may be: a *head* where numerous sessile flowers are bunched closely together on a common receptacle, as in the thistle or dandelion; a *spike* in which the flowers are also sessile but arranged around the sides of a long central axis, as in plantain and mullen; a *raceme* having each flower on its own stalk and arranged loosely along the sides of a common stalk or central axis, as in shepherd's purse and moth mullen; a *corymb* which is a flat-topped

raceme, the lower peduncles being lengthened to raise their flowers or heads to the same level as those above, as in yarrow; a *cyme* which is only a corymb with all the blossoms from terminal buds, the one on the main stem opening first, followed by those on the side shoots, as in chickweed; an *umbel,* as in milkweed and wild onion, where all the flower-stalks seem to arise from a single point like the ribs of an umbrella, whence the name.

Compound flower clusters of each of the above kinds are frequent, as the compound umbel of the wild carrot where the stalks of the first or lower umbel become themselves umbels and bear *umbellets.* A compound raceme which branches loosely and irregularly is called a *panicle* and is seen in oats and most grasses. A head, umbel or other flower cluster is often surrounded by a whorl or circle of bracts or small leaves called an *involucre.* These are present in the thistle and other Compositæ as well as in sedges and many other weeds.

THE FRUITS OF WEEDS.—In botany the word *fruit* is used to designate the mature or ripened ovary or seed vessel with the enclosed seeds, whatever its nature and whether it is edible or not. It also includes any appendages of the flower which are permanently attached to it, such as the calyx of an apple or the fleshy receptacle at the center of a blackberry. The fruits of weeds, like those of other plants, are therefore exceedingly variable in structure and form.

In general, fruits are either fleshy or dry. Not very many weeds have fleshy fruits. However the *drupe* or stone-fruit, having the outer part fleshy and the inner part hard and stony and enclosing the seed, is represented in the blackberry, where the little drupes are massed together around the fleshy receptacle, and also in the fruit of the poison ivy. The *berry* is another form of fleshy fruit in which the hard coated seeds are enclosed in and directly surrounded by the fleshy pulp. The fruits of pokeweed, horse nettle, ground cherry, etc., are therefore true berries. When eaten by birds and other animals the hard seeds of both drupes and berries are not digested but are passed with the excrement and thus gain wide dispersal.

Dry fruits are of two kinds, viz., the *indehiscent* which do not open at maturity and the *dehiscent* which split open, usually along regular lines, and scatter the seeds. Of the numerous kinds of indehiscent fruits but three are commonly met with among weeds. The *achene* is a small dry one-seeded indehiscent fruit often so seed-like in appearance that it is taken for a naked seed. However

the achene always has *two* scars, one at the base showing where it was joined to the flower-stalk, and the other at the top where the style or stigma was united to it, whereas the seed has but *one* scar indicating the point where it was joined to the ovary. The ripened pistils of the buttercups and the so-called seeds of the dandelions, catnip and hound's tongue are examples of achenes. The *utricle* is an achene with a thin loose outer covering, as seen in pigweed, lamb's quarters, etc. The *caryopsis* or grain is a dry indehiscent fruit in which the seed is firmly united with the wall of the ovary, so that both fruit and seed form one body, as in wheat, corn and the weeds of the grass family.

The dry dehiscent fruits are also numerous in kind. Among

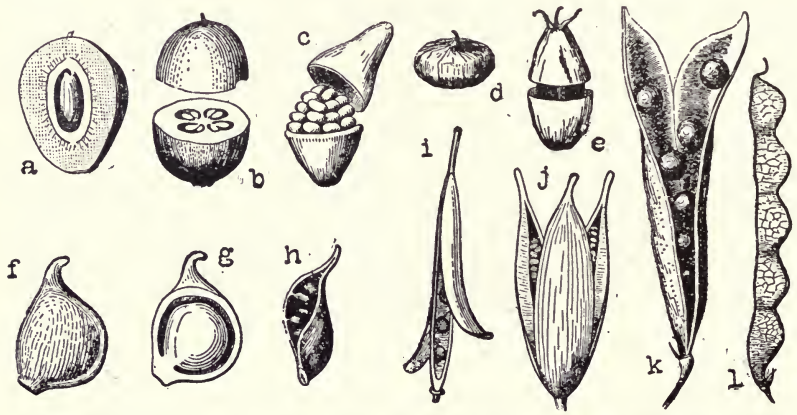


Fig 14. Illustrating forms of fruits: *a*, single *drupe* of blackberry split to show pulp, stone and inner seed; *b*, a *berry*; *c*, *pyxis* of purslane, the lid upraised; *d*, *utricle* of lamb's quarters; *e*, *utricle* of pigweed opening all around; *f*, *achene* of buttercup; *g*, same split lengthwise to show the enclosed seed; *h*, a *follicle*; *i*, *silique* of a mustard; *j*, *capsule* of a St. Johnswort; *k*, a *pod* or *legume*; *l*, *loment* or jointed pod of a tick-trefoil. (After Gray.)

them are the *pod* of the weeds of the pea family, which splits along both sides into two valves; the *follicle* of the milkweed, which splits down one side only: the *capsule* or fruit of a compound ovary, which usually splits lengthwise into several valves, as in the corn cockle, but sometimes discharges its seeds through chinks or pores, as in the velvet leaf, or bursts irregularly as in the lobelia; the *silique* of the mustard family, a pod which splits into two valves leaving a thin partition wall with the seeds attached, and the *pyxis*, a pod which opens with a little circular lid as in the plantain and purslane.

The duty of all these different forms of fruit or seed vessels is to retain and protect the ripened seeds until they are ready for distribution to fields and pastures new. Of the seed, which is the

final product of the weed—the one object of its existence—enough has been said or will be said in the pages which are to follow. Having thus described the parts of a weed we see that while they are numerous they are not difficult to learn. Anyone with a corn cockle or some other weed by his side can soon learn these parts so that he should be able, with the aid of the family keys and descriptions which follow, to locate any one of the 150 weeds which are listed. Only a little time, a little patience, a little labor are necessary and a knowledge which will open up a new world of value and of interest will be his.

Keys to Families of Weeds.

Weeds which have a number of different characters in common are grouped into a family by themselves. The 227 species of Indiana weeds hereafter considered belong to no less than 38 different families. Each of these families has both a common and a scientific name. Keys or tables leading up to each family have been prepared. A person by aid of these keys can locate the weed at hand in its proper family and then, by comparing the descriptions of the weeds grouped under that family heading with the one in hand, will soon be able to tell whether it is one of the described and listed species or not. It must be remembered that there are other plants, 1,800 and more, growing wild in Indiana which are not described in this book and it is, therefore, very probable that one of them may be the supposed weed which the person is trying to locate. If so, he may or may not be able to locate it in the family to which it belongs by the keys given, for those keys are designed only for the species of weeds listed and there are many other families of plants besides those including the weeds which are represented in the State.

How to use the key.—Gather a complete specimen of the supposed weed, roots and all. Be sure and get one in flower and if possible also partly in fruit. Have a pocket lens or magnifying glass, such as a linen tester, a sharp pocket knife and a long needle at hand. First examine the leaves and a cross section of the stem to see whether it is an *endogen* or *exogen*. (Fig. 15.) If an endogen, go to the "Key to the Families of Endogen Weeds" and compare carefully the plant with the characters mentioned after *a*. If it agrees with these go to *b* and compare with the characters there given; if it does not fit them, go to *bb* and again compare. If it fits *b* or *bb* go to the family whose name and page are given after the letter it fits, and read over the family description carefully to

see that it agrees with the weed in hand. If it did not fit *a* go to *aa* and compare. If it is an endogen and listed, it belongs either under *a* or *aa*. If it fits *aa* go to *c*, etc.

If the weed is an exogen, turn to the "Key to the Divisions of Exogens," and examine the plant for petals to see whether they are present or not. If not present, go to the "Key to the Families of Apetalous Exogens" and try that. If the petals are present see whether they are wholly separate one from another; if so, go to the "Key to the Families of Polypetalous Exogens." If they are more or less united the plant is *gamopetalous* and the family should be sought for under the "Key to the Families of Gamopetalous Exogens." Remember that whenever the plant fits *a* of a key it will run to some family whose name is given between *a* and *aa*. If

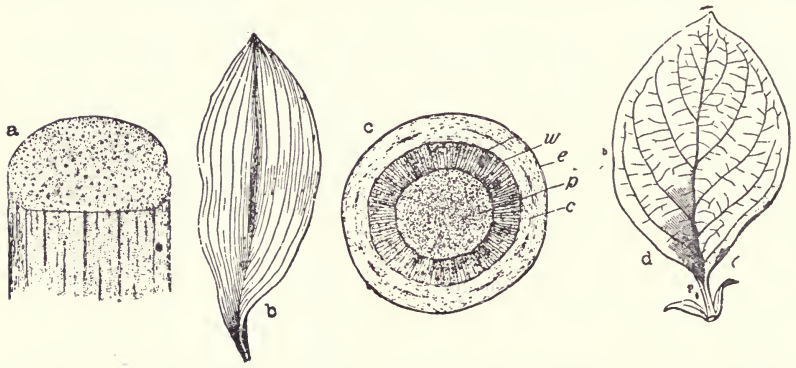


Fig. 15. Illustrating the differences between endogens and exogens: *a*, cross-section of corn-stalk, the dots showing the tops of the long strands of woody fibre scattered irregularly through the pith; *b*, *parallel veined* leaf of an endogen; *c*, cross-section of stem of an endogen, showing the 4 stem regions, *e*, the *epidermis*, *c*, cortex or *bark*, *w*, the *wood*, *p*, the *pith*; *d*, *netted veined* leaf of exogen with *stipules* at base. (After Coulter and Gray.)

it fits *a* and *b* it will run to a family between *b* and *bb*. Whenever it does *not* fit a letter go to the double of the same letter, and from there on down the key, never backward. If it fits the characters given after a letter, as *c*, and there is no family name following *c* then go to *d* and so on down the key until a family name occurs after a letter.

As with the endogens, when it runs to a family name turn to the page given and compare carefully the weed with the description there given. If the weed agrees with this description then read the descriptions of the different weeds under that family until you find one with which your plant agrees. If the family description does not fit the weed a mistake has more than likely been made in running it into that family. In a work of this kind, where the family descriptions and descriptions of species are neces-

sarily brief, it is more than probable that some of the characters given will not agree with the plant in hand. All plants vary more or less, no two individuals being exactly alike. If the most of the more important characters agree it is very probable that the plant has been correctly traced.

All of the weeds listed belong to the sub-kingdom of plants known as *Spermatophyta* or seed-bearing plants in which the pollen grains develop into pollen tubes which find their way to embryo sacs in ovules and there fertilize the germ cells or microscopic eggs, which remain enclosed in the ovules until they ripen into seeds. All of them also belong to the class *Angiospermæ* or flowering-plants in which the ovules are enclosed in an ovary which becomes the fruit.

KEY TO SUBCLASSES OF ANGIOSPERMÆ.

a. Leaves with parallel veins, mostly alternate, entire, linear or grass-like and sheathing the stem at base; stem without distinct layers of bark, wood and pith; embryo of the seeds with one seed-leaf, the first leaves of the sprouting plant alternate; parts of the flowers usually in 3's or 6's. ENDOGENS, p. 45.

aa. Leaves with netted veins; stems formed of circular rings of bark, wood and pith; embryo and young plant with a pair of opposite seed-leaves; parts of the flowers rarely in 3's or 6's. EXOGENS, p. 46.

KEY TO THE FAMILIES OF ENDOGEN WEEDS.*

a. Ovaries simple, distinct, 1-celled, 1-seeded, formed of a single carpel; flowers without sepals or petals, borne in the axils of dry chaffy scales (glumes) and arranged in spikes or spikelets.

b. Stems (culms) mostly hollow, cylindrical; sheaths split to the base; glumes in pairs; fruit a grain. GRASS FAMILY, p. 50.

bb. Stems solid, often triangular; sheaths closed; glumes single; fruit an achene. SEDGE FAMILY, p. 57.

aa. Ovaries compound, formed of 2 or more carpels; flowers complete, their parts in 3's or 6's.

c. Sepals and petals (perianth) green or brown; stems rush-like with grass-like leaves; flowers small (stamens 6 and leaves all basal in our weeds.) RUSH FAMILY, p. 59.

cc. Petals or inner part of the perianth colored; fruit a 3-celled capsule splitting down the back of each carpel; plants mostly springing from bulbs; our weeds with an onion-like odor. LILY FAMILY, p. 60.

*The keys as given include only the families to which the weeds hereafter listed belong.

KEY TO THE DIVISIONS OF EXOGENS.

a. Petals wholly wanting; calyx present, except in some spurges.
APETALOUS EXOGENS, p. 46.

aa. Petals and sepals both present.

b. Petals all separate and distinct one from another, except in the pea family where the lower two are often united. (Figs. 9; 10, *a.*) POLYPETALOUS EXOGENS, p. 46.

bb. Petals more or less united into one piece. (Fig. 10, *b-g.*)
GAMOPETALOUS EXOGENS, p. 47.

KEY TO THE FAMILIES OF APETALOUS EXOGEN WEEDS.

a. Fruit an achene, 1-celled, 1-seeded; ovary 1 only, superior. (Nettles, docks, smartweeds, etc.)

b. Herbs with small clustered greenish flowers, and, in our weeds, with stinging hairs; stipules not forming a circular sheath about the joints; achenes compressed, ovate or oblong.
NETTLE FAMILY, p. 61.

bb. Herbs without stinging hairs but usually with a sour or very acrid juice; stipules forming a cylindrical sheath about the joints of stem; achenes 3-sided or 3-angled. BUCKWHEAT FAMILY, p. 63.

aa. Fruit not an achene; ovary 1 only, superior. (Lamb's quarters, pigweeds, pokeweed, spurges, etc.)

c. Leaves without milky juice; fruit not 3-seeded.

d. Leaves not in whorls; fruit not a capsule; stem usually erect.

e. Fruit a utricle, 1-celled, 1-seeded (Fig. 14, *d, e.*); stipules none.

f. Flowers not surrounded by dry pointed bracts; sepals green or greenish; leaves and stems usually white-mealy or glandular. GOOSEFOOT FAMILY, p. 69.

ff. Flowers each surrounded by 3 dry persistent awl-shaped bracts; sepals brown or colorless; plant not mealy or glandular. AMARANTH FAMILY, p. 72.

ee. Fruit a fleshy 10-seeded berry; styles and stamens 10 each; ovary 10-celled; flowers numerous in terminal racemes; leaves alternate, entire. POKEWEED FAMILY, p. 75.

dd. Leaves in whorls of 5's or 6's; stem prostrate, spreading; fruit a 3-celled capsule. CARPET-WEED FAMILY, p. 76.

cc. Leaves with a milky acrid juice; staminate and pistillate flowers of our weeds separate but on the same plant, the pistillate ones enclosed by a cup-shaped involucre or a leaf-like bract; fruit 3-seeded. SPURGE FAMILY, p. 91.

KEY TO THE FAMILIES OF POLYPETALOUS EXOGEN WEEDS.

a. Stem leaves opposite, entire.

b. Leaves not punctuate with pellucid and dark dots; stamens not over 10, separate; ovules borne on a central column; corolla not yellow. PINK FAMILY, p. 77.

bb. Leaves and petals with numerous very small round pellucid or dark dots; stamens very numerous united in 3 or more sets; ovules borne on the walls of the ovary; corolla yellow.
ST. JOHN'SWORT FAMILY, p. 98.

aa. Stem leaves of our weeds either alternate or clustered at the ends of the branches.

c. Stem prostrate, succulent, spreading; leaves mostly clustered at the ends of the branches; sepals 2; corolla regular, yellow. PURSLANE FAMILY, p. 76.

cc. Stem rarely prostrate, or if so not succulent and the sepals more than 2.

d. Ovary superior or wholly free from the calyx.

e. Stamens numerous, at least more than 10; corolla regular.

f. Stamens all separate and distinct; ovaries simple, 1-celled.

g. Sepals all separate and distinct; petals and stamens borne on the receptacle at the base of the ovaries; stipules none; our weeds with simple more or less lobed leaves and yellow corollas. CROWFOOT FAMILY, p. 80.

gg. Sepals more or less united at base; petals and stamens borne on the calyx; stipules present; our weeds with compound, 3–5 foliate leaves and white or yellow corollas. ROSE FAMILY, p. 85.

ff. Stamens all united in a column and connected at base with the short claws of the petals (Fig. 11, *b.*); ovaries compound, several celled, often united in a ring. MALLOW FAMILY, p. 95.

ee. Stamens not more than 10.

h. Petals 4; stamens 6, 4 long, 2 short, rarely only 2; fruit a silique; herbs with a pungent watery juice. MUSTARD FAMILY, p. 81.

hh. Petals 5, the lower 2 often more or less united; stamens never 6 or 2; fruit not a silique.

i. Herbs; fruit a legume or pod; flowers mostly irregular and shaped like those of a pea (regular in *Cassia* or wild senna). PEA FAMILY, p. 88.

ii. Shrubs or woody vines; fruit a small drupe; flowers regular; our included species with milky poisonous sap. SUMAC FAMILY, p. 94.

dd. Ovary inferior or partly or wholly united with the calyx.

j. Flowers not in umbels, yellow, nocturnal; leaves simple; stamens in our weeds 8; ovules numerous in each cell of the ovary. EVENING-PRIMROSE FAMILY, p. 99.

jj. Flowers in umbels, white or yellow, diurnal; leaves in our weeds, compound; stamens 5; ovules 1 in each cell of ovary. PARSLEY FAMILY, p. 100.

KEY TO THE FAMILIES OF GAMOPETALOUS EXOGEN WEEDS.

a. Ovary superior or wholly free from the calyx.

b. Corolla not thin dry and colorless; leaves not all basal; flowers not in spikes on leafless flower stalks.

c. Herbs with milky juice; leaves mostly opposite; fruit a follicle; seeds bearing a long tuft of white hairs; ovaries 2, separate.

d. Stamens distinct; pollen in ordinary grains; follicles very slender, cylindrical, pointed. DOGBANE FAMILY, p. 104.

dd. Stamens united by their filaments to form a tube; pollen grains united into waxy masses; follicles robust. MILKWEED FAMILY, p. 105.

cc. Stems and leaves without milky juice; fruit not a follicle; seeds without tufts of hairs; leaves opposite or alternate; ovary 1, compound.

e. Corolla regular (slightly irregular in blueweed of the Borage Family).

f. Ovary not deeply 4-lobed; fruits not separating as 1-seeded nutlets when ripe.

g. Stamens 5; flowers not in terminal spikes; leaves alternate.

h. Twining or trailing vines; fruit not a berry or a large prickly capsule.

i. Stems white or yellowish, leafless, twining, parasitic vines. DODDER FAMILY, p. 110.

ii. Stems green, leaf-bearing vines; flowers of our weeds large, funnel-form or bell-shaped. MORNING-GLORY FAMILY, p. 107.

hh. Erect and branching herbs, not vines; fruit a berry or a large prickly capsule; corolla either bell- or wheel-shaped, or large funnel-form and ill-smelling. POTATO FAMILY, p. 124.

gg. Stamens 4, 2 long, 2 short; flowers of our weeds white or blue in erect spikes terminating the stems or branches; leaves opposite. VERVAIN FAMILY, p. 115.

ff. Ovary deeply 4-lobed around the style; fruit separating as nutlets, those in our weeds mostly armed with barbed prickles; leaves and stems rough hairy. BORAGE FAMILY, p. 112.

ee. Corolla irregular, more or less 2-lipped (nearly regular in the mullens and true mints of the Figwort and Mint Families).

j. Ovary 4-lobed around the style, the lobes ripening into smooth 1-seeded nutlets; stem 4-sided; leaves simple, opposite, when crushed emitting an aromatic odor. MINT FAMILY, p. 117.

jj. Ovary 2-celled; fruit a many-seeded capsule; stems rarely 4-sided; leaves mostly alternate, not aromatic.

k. Herbs with rather small flowers; stamens mostly 2 or 4 (5 in the mullens); seeds borne on a central axis, not winged. FIGWORT FAMILY, p. 129.

kk. Woody vines with large trumpet-shaped orange flowers; stamens 5; fruit a long pod-like capsule; seeds borne on the margins of the partition separating its cells, winged. TRUMPET-CREEPER FAMILY, p. 134.

bb. Corolla thin, dry and membranous, withering on the pod; leaves of our weeds all basal; flowers in dense spikes on slender leafless flower stalks. PLANTAIN FAMILY, p. 135.

aa. Ovary inferior or more or less united with the calyx.

l. Flowers not closely bunched into a head which is surrounded by a leafy involucre; those of our weeds mostly 2-lipped, blue or bluish; stems with an acrid and usually milky juice.

BELL-FLOWER FAMILY, p. 140.

ll. Flowers closely bunched into a head surrounded by a leafy involucre.

m. Flowers of head *all* ligulate or split into flat rays (Fig. 10, *g.*), mostly yellow; juice of stems and leaves milky.

CHICORY FAMILY, p. 142.

mm. Flowers all tubular or only the outer ones of the head with rays; juice not or rarely milky.

n. Stamens not united by their anthers into a ring or tube around the style.

o. Leaves all opposite, their ribs and the flower-stalks prickly; heads very large, oblong-cylindrical, with numerous long spiny-tipped awns; flowers all perfect.

TEASEL FAMILY, p. 139.

oo. Leaves alternate, mostly divided or lobed, not prickly; staminate and pistillate flowers of our weeds in separate heads on the same plant, the latter without a corolla. RAGWEED FAMILY, p. 149.

nn. Stamens united by their anthers into a tube or ring about the style; fruit or so-called seed an achene, usually bearing a tuft of hairs or several awns. (Figs. 10, *g*; 11, *f*, *g.*)

THISTLE FAMILY, p. 153.

* * *

The arrangement and names of the weeds listed are mainly those of Britton and Brown's "Illustrated Flora of the Northern States and Canada." This is a work of three volumes published by Chas. Scribner's Sons, N. Y., and is the only systematic botany in which all species described are figured. Twenty-five of the illustrations used in this book were taken from it. The others are from the works of the various authors whose names are mentioned under the respective figures.

At the end of the descriptions will be found a list of the principal books or papers which have been used in the preparation of this work, and also a glossary of the more important botanical terms which have been used.

The first letter in the parenthesis after the common names of each weed listed shows whether the plant is an annual (A.), a biennial (B.) or a perennial (P.). The second letter denotes whether it is introduced (I.) or native to Indiana (N.). The figure 1, 2 or 3 shows the class to which the weed has been assigned by the writer, (See p. 12). Thus, 1 denotes that the weed belongs to Class I., 2 a weed of Class II. and 3 a weed of Class III.

A DESCRIPTIVE CATALOGUE OF INDIANA WEEDS.

The Grass Family.—GRAMINEÆ.

Annual or perennial herbs having the stems (culms) usually hollow, their joints closed; leaves alternate, linear and sheathing the stem, the sheaths split or open on the side opposite the blade; roots fibrous. Flowers usually in panicled spikes, composed of little spikes called spikelets; calyx and corolla absent but they and their involucre represented by chaffy scales or bracts, known as glumes; stamens usually 3, anthers attached at middle at the point of the filament (Fig. 11, *d*) and swinging loosely thereon, thus enabling the wind to easily pollenize the hairy or feather-like stigmas; ovary 1-celled with a single ovule. Fruit a seed-like "grain."

A very large and most important family furnishing the food-grains (cereals) of man, and the principal food of cattle. About 175 species of grasses are known to grow wild in Indiana, the majority of them being tufted, turf-forming plants, marked by underground rootstocks which branch and creep beneath the surface of the soil. Their flower clusters vary greatly in form and size, ranging from the solid spikes of timothy and foxtail to the loose and straggling clusters of the panicums and blue-grass. Among them are many forms which, though at times furnishing grasses for stock, are enemies of cultivated crops, being introduced into the fields by the sowing of their seeds with grain or other grass seeds. Ten of the worst of these are herewith described as weeds while 5 others are mentioned.

"Grass is the most widely distributed of all vegetable life, and is at once the type of our life and emblem of our mortality. Lying in the sunshine among the buttercups and dandelions of May, scarcely higher in intelligence than the minute tenants of that mimic wilderness, our earliest recollections are of grass, and when the fitful fever is ended and the foolish wrangle of the market and the forum is closed, grass heals over the scar which our descent into the bosom of the earth has made, and the carpet of the infant becomes the blanket of the dead.

"Grass is the forgiveness of nature—her constant benediction.

Fields trampled with battle, saturated with blood, torn with the ruts of cannon, grow green again with grass and carnage is forgotten. Streets abandoned by traffic become grass-grown like rural lanes, and are obliterated. Forests decay, harvests perish, flowers vanish, but grass is immortal. It bears no blazonry of bloom to charm the senses with fragrance or with splendor, but its homely hue is more enchanting than the lily or the rose. Should its harvest fail for but a single year, famine would depopulate the world."—*J. J. Ingalls.*

1. ANDROPOGON VIRGINICUS L. Virginia Beard-grass. Broom Sedge. (P. N. 2.)

Fig. 16. *a*, a spike; *b*, sessile spikelet; *c* and *d*, first and second glumes. (After Scribner.)

Erect in dense tufts, smooth, 2–4 feet high; culms with numerous short branches, light green when young, brownish-yellow when mature; leaves 6–12 inches long, acuminate, rough on the margins. Spikes in pairs or sometimes 3 or 4, about 1 inch long, and protruding from the side of the inflated leaf which surrounds the flower-stem, the latter slender, jointed and pubescent with many long spreading silky hairs; spikelets in pairs, one of them sessile and perfect, the other wholly wanting or represented by a mere scale. Seeds oat-like, $\frac{1}{8}$ inch long with a straight $\frac{1}{2}$ inch awn at tip. (Fig. 16.)

Common in the southern half of State and gradually spreading northward. July–Sept. Occurs in poor clayey or sandy upland soil, especially on hill slopes where the rocks come close to the surface. Spreads both by wind-carried seeds and rootstocks and apt to become a serious pest. Remedies: grubbing out the first bunches which appear; burning the land over in early autumn to destroy the seeds; thorough cultivation; seeding with clover or cow-peas.

The broom beard-grass (*A. scoparius* Michx.) is also very common in dry soils in southern Indiana and becoming frequent northward. It differs in having the joints of the flower-stem (rachis) thickened or club-shaped at the ends; the spikes solitary, loose and distant and the awn of the seed bent at base. Remedies the same.

2. SYNTHERISMA SANGUINALIS L. Crab-grass. Finger-grass. (A. I. 1.)

Fig. 17. *a* and *b*, spikelets; *c*, flowering glume. (After Scribner.)

Suberect or spreading, often rooting at the lower joints, 1–3 feet long; leaves smooth or sparingly hairy, 2–6 inches long. Spikes 3–10 in number, linear, often purplish, 2–6 inches long, in whorls and spreading like fingers from the top of the culm; spikelets in pairs, ⅛ inch long, one sessile or nearly so, second scale half as long; flowering stem flat and winged. Seeds straw-color, 1/10 inch long (Fig. 17.)

Abundant in gardens, lawns and cultivated grounds. June–Oct. After midsummer in wet seasons one of the worst of lawn weeds often crowding out the blue-grass. When cut or pulled and thrown aside its stems quickly take root from the joints and are soon as luxuriant as before. Dry sandy fields in which melons and other early crops are cultivated are often over-run in late autumn with this foreign grass. The small crab-grass (*S. linearis* Krock.), differing in having the spikelets shorter, 1/12 inch long, the second scale about as long, the leaves and stems shorter, is also quite common in similar places. Remedies: for lawns, pulling and burning; clean grass seed; for gardens and fields, late hoeing and thorough cultivation; burning over in autumn.

3. PANICUM CRUS-GALLI L. Barnyard Grass. Cockspur Grass. (A. I. 3.)

Stems erect, stout, often branching at base, 1–4 feet high; leaves 6 inches to 2 feet long, rough-margined. Spikes or branches of the flowering panicle 5 to 15 in number, erect or reflexed; spikelets in 2–4 rows, green or purple, crowded on one side of the flowering stem; glumes of the neutral flowers

Fig. 18. *a* and *b*, spikelets; *c* and *d*, flowering glumes. (After Scribner.)

awn-pointed. Seeds ⅛ inch long, pale brown, flat on one side, rounded on the other. (Fig. 18.)

Frequent in barn-yards, orchards and rich moist waste places. June–Sept. Often cut for forage when other grass is scarce. Seeds distributed in clover and millet seed, also by wind. Remedies: mowing before the seeds are ripe; clean clover seed.

4. PANICUM CAPILLARE L. Old-witch Grass. Tumble-weed. Tickle-grass. (A. N. 2.)

Fig. 19. *a*, *b* and *c*, spikelets; *d*, flowering glume; *e*, palea. (After Scribner.)

Erect or suberect, 1–2 feet high, much branched from the base; sheaths hispid or hairy; leaves 6–12 inches long, more or less hairy. Flowers in a spreading panicle; spikelets, single, scattered, borne on very slender stalks; lower glume half the length of the empty upper one. Seeds straw-color, very small, smooth and shining. (Fig. 19.)

Common in old cultivated fields, especially those with a dry or sandy soil. July–Oct. The spreading tops, being very brittle, break off in autumn and are blown into fence corners or against some barrier where they form great piles. Remedies: mowing and burning to prevent seeding. About 30 species of *Panicum* grow wild in Indiana, all of which are more or less weedy in character, though some of them are cut for hay when other grass is scarce.

5. IXOPHORUS GLAUCUS L. Yellow Foxtail. Pigeon-grass. Pussy-grass. (A. I. 1.)

Stems several, erect, more or less branched, 1–3 feet high; leaves 2–6 inches long, smooth. Spikes straw-yellow, cylindrical, dense, 1–4 inches long; spikelets oval, much shorter than the cluster of 6 to 11 yellow bristles which spring from beneath them, these roughened or barbed upward. Seeds brownish, ⅛ inch long, flattened on one side, much wrinkled crosswise. (Figs. 6, *g*; 20.)

One of our worst weeds, occurring everywhere in cultivated grounds; also in meadows, lawns and pastures. July–Sept. The seeds in grain fields mostly ripen after the corn has been laid by or the oats and wheat cut. They are much relished by birds and poultry and are sometimes destroyed by a smut. When buried they retain

Fig. 20. *a* and *b*, spikelets, *a* showing the bristles which spring from beneath. (After Scribner.)

their vitality for years, ready to spring up whenever conditions are favorable. Remedies: use of clean seed; smothering when young; mowing and burning stubble, followed by fall plowing; cultivation throughout the season; sheep grazing in pastures, old fields and the aftermath of meadows. A flock of sheep will soon clean out all the weeds in a corn field, without injury to the corn, if turned in for a few days in early autumn.

The green foxtail or bottle-grass (*I. viridis* L.) is a closely allied species which is also common in the State. The spike is green, more loosely seeded and tapers at the end, and the bristles are longer and also greenish. Remedies the same.

6. CENCHRUS TRIBULOIDES L. Sand-bur. Bur-grass. Hedgehog-grass. (A. N. 1.)

Suberect or spreading, branching freely, 8 inches to 2 feet long; sheath loose, compressed; leaves flat, 3–5 inches long, smooth. Spikelets enclosed, 1 to 5 together, in a globular bristly or spiny cover, which hardens and falls off with them as a rigid bur. (Fig. 21.)

Common in sandy soil throughout the State. July–Oct. The points on the spines of the burs have barbs directed backwards so that the bur sticks very closely to wool, fur or clothing and thus distributes far and wide the enclosed seeds. They are said to be more injurious in wool than the burs of any other weed. Old Linnæus must have pricked his finger on one of the barbed spines when he named this grass *tribuloides*. It is a tribulation indeed to barefooted boys. Very troublesome also is it to wool-growers

Fig. 21. *a*, bur; *b*, the same split to show the enclosed spikelets; *c*, spikelet with glumes. (After Scribner.)

Fig. 22. (After Vasey.)

and a great nuisance in hay cut from sandy soil. Remedies: burning over annually the area infested; hoeing or other close cultivation.

7. ERAGROSTIS MAJOR Host. Stinkingrass. Pungent Meadow-grass. (A. I. 2.)

Erect or spreading at base, 6 inches to 2 feet tall, smooth; leaves 2–7 inches long; sheaths shorter than the joints. Flowers in a compound panicle 2–6 inches in length, its branches spreading; spikelets densely 8–35 flowered, very flat, whitish when old. Seeds pale red, very small, nearly round. (Fig. 22.)

A showy ill-smelling grass, occurring in sandy soil, meadows and waste places. July–Sept. The flat lead-colored heads make it easily known. Remedies: prevent seeding by late and thorough cultivation.

The low meadow-grass (*E. eragrostis* L.) is a closely allied species with shorter stems and spikes and narrower spikelets. Also introduced and spreading rapidly. Remedies the same.

8. BROMUS SECALINUS L. Cheat. Chess. (A. I. 2.)

Erect, unbranched, 1–3 feet tall; sheaths shorter than the joints; leaves 2–9 inches long. Flowering panicle 2–8 inches in length, glabrous, its branches drooping; spikelets oblong-ovate, swollen, 6–10 flowered, the nerves of the scales often awned or bristle tipped. Seeds resembling those of oats but darker and smaller, $\frac{3}{8}$ inch long, the adhering glumes with a row of bristles down each side of the groove. (Fig. 23.)

Fig. 23. *a*, spikelet. (After Scribner.)

A winter annual, common in grain fields and often along fencerows. June–Aug. The seeds when buried retain vitality for years

and then often spring up where clean seed wheat has been sown, giving rise to a common belief among farmers that wheat turns to cheat. Needless to say, the two are very distinct grasses and each comes always from its own seed. Remedies: preventing the seed from ripening by pulling or mowing the cheat; sowing clean seed of wheat, oats or other cereal; cultivation with hoed crops.

The downy brome-grass or slender chess (*B. tectorum* L.) occurs in the northern part of the State, and is liable to become a bad weed. It may be known by its weak stem and somewhat one-sided downy panicles. The lower empty scale is but 1-nerved whereas in cheat it is 3-nerved. Remedies the same.

9. AGROPYRON REPENS L. Couch-grass. Quack-grass. Dog-grass. Devil's-grass. (P. I. 1.)

Stems several, 1–3 feet tall, from a long jointed running rootstock; sheaths smooth; leaves flat, rough above. Spike 2–8 inches long, not branched; spikelets in 2 rows, 3–7 flowered, the scales glabrous, acute or short-awned. Seeds slender, $\frac{3}{8}$ inch long, 5–7 nerved and short-awned at tip. (Fig. 24.)

A perennial grass, sometimes cut for hay but in most places a vicious weed, occurring in grain fields, spreading by its large, strong creeping rootstocks and crowding out the grain. June–Sept. The rootstocks run just beneath the surface and are so strong and unyielding that they have been known to push their way through a potato. Remedies: (*a*) in cultivated fields, shallow plowing in early autumn, then harrowing to work the rootstocks free from the soil, followed by raking and burning, or if too wet, throwing them into heaps and allowing them to rot. A second and deeper plowing, harrowing and raking will often be necessary to thoroughly remove the deeper growing stocks. Such fall plowing, followed by thorough cultivation the next season, will usually clean out the weed. (*b*) Shallow plowing and harrowing in hot dry weather. (*c*) Plowing under

Fig. 24. (After Vasey.)

deeply after the grass has been cut for hay. (*d*) In lawns, hoe-cutting and salting, burning or removing every joint.

In Europe these underground stems are gathered and sold, being used in medicine for kidney and bladder troubles. They are pale yellow, smooth, about ⅛ inch in diameter, with joints at intervals of an inch from which slender rootlets are produced. When washed, cut into short pieces, about 2/5 inch in length, on a hay or feed cutter and dried, these rootstocks (not the rootlets) are sold to the drug trade as dog-grass or triticum, the price ranging from 3 to 7 cents per pound.

10. HORDEUM JUBATUM L. Wild Barley. Squirrel-tail Grass. Skunk Grass. (P. N. 2.)

Fig. 25. *a*, spikelet. (After Scribner.)

Erect, simple, smooth, 10–30 inches high; sheaths shorter than the joints; leaves flat, 1–5 inches long, erect, rough. Spikes terminal, cylindrical, 2–4 inches long; spikelets in two opposite rows, usually in 3's at each joint of the flower-stem, the central one containing a perfect flower, the two side ones imperfect; the empty scales forming rough awns, barbed upwards, 1–3 inches long; awn of flowering scale 1–2 inches long. Seed slender, ⅛ inch long, sharp-pointed. resembling that of rye. (Fig. 25.)

Frequent in old fields and along fence-rows and railways in dry and rather poor clayey or gravelly soil. July–Sept. It grows usually in large tufts from fibrous roots and is easily known by the grayish-green leaves and long, bearded nodding spikes. The barbed seeds and awns often penetrate the flesh surrounding the mouths of animals which attempt to eat it, causing ulcers, swellings, and, in some instances, total blindness. Hay containing the grass is therefore almost valueless. It spreads only by seeds, which are widely scattered by wind and water, and can be controlled by cutting or pulling before the seeds ripen, or by cultivation. Isolated clumps should be destroyed wherever seen.

THE SEDGE FAMILY.—CYPERACEÆ.

A large family of grass-like or rush-like herbs, but having the stems slender, generally solid instead of hollow and often either triangular or 4-sided; leaves grass-like, with the sheaths closed;

roots fibrous. Flowers without petals or sepals, arranged in spikelets and usually solitary in the axils of each scale or glume; stamens 1–3; ovary 1-celled, producing a single seed which in fruit usually forms a three-cornered nutlet called an achene.

About 160 species of the family are known from the State. For the most part they grow in damp places, as the borders of streams and lakes, along ditches and the margins of sloughs They are commonly known as sedges, cotton-grasses, spike-rushes, bulrushes, nut-grasses, etc., and have little or no economic value. A few of them on wet prairies and lake margins are cut for hay, but it is coarse-stemmed and of poor quality. Occupying waste places, as they generally do, they are given little attention by the farmer, and though many of them, did they grow in cultivated ground, are abundant enough to be called weeds, only a few have a tendency to spread. Like the grasses, the sedges are mostly plants of open windswept places or marshy levels, where the facilities for wind fertilization are greatest and more usually present.

Fig. 26. (After Smith.)

11. CYPERUS ESCULENTUS L. Yellow Nut-grass. Galingale. (P. N. 3.)

Stems erect, stout, triangular, 1–2½ feet tall, shorter than the basal leaves, which are light green, 1/3 inch wide. Flowers in an umbel with 4–10 branches and involucre of 3–6 leaves; spikelets numerous, straw-colored, flat, their flower-stalk narrowly winged; style 3-cleft. Achenes obovate-oblong, 3-angled. (Fig. 26.)

Common in low cultivated ground which has been recently drained. July–Oct. Spreads by underground stems bearing small pear-shaped tubers, ½ inch in length, at intervals of a few inches; seeds also carried in hay, and grass seed, and the tubers often on cultivating tools. The numerous tubers are edible, containing about 22 per cent. of oil, 28 per cent. of starch and 12 to 21 per cent. of gum and sugar. The oil when extracted is said to be most excellent for cooking purposes. In rich sandy loams this sedge is often allowed to grow as a food for hogs, which are turned into the field in autumn to root up the tubers. Remedies: frequent

hoeing throughout the season; keep fence rows clean; thick seeding with clover or timothy.

An allied species, the straw-colored sedge (*C. strigosus* L.) differing in propagating by solid bulb-like tubers from the base, the spikes longer and more loose and achenes linear-oblong, is also a common weed in damp soils. Remedies the same.

The Rush Family.—JUNCACEÆ.

Perennial or annual grass-like herbs, often growing in tufts; stems usually simple, slender, cylindrical; leaf-blades terete, grass-like or channeled, the sheaths with free margins. Flowers small, clustered; sepals and petals 6, chaff-like, without scales or glumes beneath them as in the two preceding families; stamens 3 or 6; ovary 1- or 3-celled with 3 stigmas. Fruit a small capsule opening at the sides; seeds usually numerous.

Only about 25 kinds of rushes are known from the State. They usually occur on the sandy beaches of lakes or along the borders of marshes and swamps and resemble sedges but have the parts of the small flowers in threes, like the lily family, but not showy as there. Neither the scouring rush nor the tall bulrushes belong to this family, so that their names are misleading. Only one of the true rushes is with us to be considered as a weed.

12. Juncus tenuis Willd. Wire-grass. Slender Rush. Yard Rush. (P. N. 3.)

Stems erect, slender, tufted, wiry, 8–20 inches high; true leaves all basal, flat, linear, half the length of stem; leaf-like bract just below the flowering portion longer than the latter. Sepals and petals green, lanceolate, acute, spreading, longer than the egg-shaped capsule; stamens 6. Seeds narrowly oblong with oblique ends, very small, delicately ribbed and cross-lined. (Fig. 27.)

Fig. 27. Showing fruit and seed. (After Britton and Brown.)

Common in dry or moist soil, especially along woodland pathways, borders of fields and roadsides. June–Aug. The stems are full of elasticity and after being trodden upon by man or beast spring erect, apparently unharmed. It is this property of uprising after adversity which enables the wire-grass to thrive along the pathways and crowd therefrom the more valuable blue-grass which remains down when crushed beneath the heel or hoof. Remedies: sheep-grazing; thorough cultivation where found in fields.

The Lily Family.—LILIACEÆ.

Herbs with grass-like leaves, arising usually from bulbs or corms, rarely from rootstocks or fibrous roots. Flowers solitary or clustered, perfect, the calyx and corolla colored alike and forming a perianth, their six divisions either distinct or more or less united to form a tube; stamens 6, borne on the tube of the perianth or at the base of its segments; ovary 3-celled. Fruit a capsule, opening lengthwise.

As above defined the Lily Family comprises about 1,300 species of widely distributed plants, many of them producing the most showy and graceful of flowers. The different species of trilliums, wake-robins, smilax or green-briers and bellworts, bunch flowers, etc., have been separated by modern botanists to form 3 distinct families, thus greatly decreasing the number formerly included within its bounds. As a result only about 20 species, belonging to the family as limited, grow wild in Indiana. These include the day and wood lilies, wild onions and garlics, adder's-tongues and wild hyacinths. Of these but one is common and troublesome enough to be termed a weed.

13. Allium vineale L. **Wild or Field Garlic. Wild Onion. (A. or B. I. 1.)**

Stem 1–3 feet high, springing from an egg-shaped bulb; leaves 2–4, narrowly linear, hollow, terete, channeled above, borne below the middle of the flowering stem; the early basal leaves similar, 4–10 inches long. Flowers numerous, green or purplish, in a terminal erect cluster or umbel, often wholly or in part replaced by small bulblets which are tipped by long hair-like appendages; bracts below the flowers 2, lanceolate, pointed, soon falling off; flower stalks much longer than the flowers. Seeds black, flat, triangular, 1/16 inch long. (Fig. 28.)

Fig. 28. *a*, mature plant bearing bulblets and flowers; *b*, young shoot; *c*, bulblet with filament and same enlarged; *d*, cross-section of leaf. (After Dewey.)

Common in rather thin clayey soils in southern Indiana. June–Aug. This weed has a strong onion-like odor and the numerous bulblets which it bears, like sets of common onions at the top of the stem, are formed early enough to be harvested with wheat and spoil the flour. Where found in pas-

tures cows eat the stems and leaves, which impart their odor to the milk and butter, and the flesh of animals eating them is also tainted with the flavor. The bulblets are produced more often than the seed and must be destroyed or prevented from forming if the garlic is eradicated. Where the tops are not allowed to produce bulblets the garlic develops numerous small secondary bulbs or "cloves" at the base of the old underground bulb. In late autumn these send up tufts of blue-green shoots which are apparently little injured by the cold of winter. By spring the small bulbs become as large as peas and soon develop a flowering stalk. In general both bulbs and bulblets spread slowly unless scattered by plow or harrow or some other device of man.

The garlic was first introduced into Indiana near New Ross with bulbs of the grape hyacinth brought from New York. In the southwestern part of the State it was brought in by bulblets in impure wheat and in recent years much complaint of it has been made by the wheat growers of the White and Wabash valley regions. Remedies: (*a*) late fall plowing at such a depth as to leave as many bulbs as possible close to the surface where they may be exposed to alternate thawing and freezing, the surviving shoots to be destroyed by early spring cultivation and the land then sowed to oats or put in corn. This process repeated for two seasons will destroy most of the garlic and the remaining plants can be pulled or treated with strong carbolic acid, a dozen drops of which, applied by a machine oil can to a bunch of underground bulbs, will kill them all. (*b*) Increased liming and fertilization and short rotation of crops, crowding out with clover. (*c*) In pastures, salting and sheep grazing. (*d*) In lawns, applications of carbolic acid.

The Nettle Family.—URTICACEÆ.

Herbs with watery sap, simple leaves, small greenish flowers and often armed with stinging hairs. Sepals 2–5, often united; petals none; stamens as many as the sepals and opposite them; ovary 1-celled, 1-seeded, when ripe forming an achene.

But six species of the family are listed from the State, five of which may be classed as weeds, though only two are in places common enough to be troublesome. Those which sting have the stems and leaves provided with peculiar hairs which are hollow, very sharp-pointed and have swollen bases around which a cluster of cells form a cup-like gland. When these hairs strike and enter the flesh their tips are broken off and the glandular cells contract and inject through them a very irritating acid which produces the

stinging sensation. This nettle sting is one of the highest devices by which plants guard themselves against the attack of animals. Weeds, or shrubs with juicy tender leaves, are very apt to be eaten by rabbits, cows, sheep, etc. Many of the wild plants have therefore developed some means of protection, such as the spines or prickles of the blackberry, thistle, rose and hawthorne; the bitter taste or bad smell of hound's tongue, dog-fennel and catnip; the many hairs of the mullen, and the acrid or poisonous juice of the buttercups, poison ivy, spurges and smartweeds. The nettle, however, is not only defensive but even aggressive in its protection, so that when any herb-loving animal thrusts his tender nose against it the sharp points pierce his skin, the liquid is injected into his veins and he receives a lesson which prevents him from ever attempting to devour another plant of its kind. Only three of our nettles possess these stinging hairs.

14. URTICA GRACILIS Ait. Slender Nettle. Tall Nettle. (P. N. 3.)

Fig. 29. Showing a flower and fruit. (After Britton and Brown.)

Stem slender, erect, simple or few branched, 2–6 feet high; leaves opposite, slender-stalked, ovate-lanceolate, acuminate, sharply notched. Flowers small, greenish, borne on slender panicled spikes from the axils of the leaves; sepals and stamens 4, the flowers dioecious, i. e., male and female flowers on separate plants. Achenes very small, oval, 1/20 inch long. (Fig. 29.)

Frequent in fence-rows and along borders of cultivated fields, especially in moist soil. June–Oct. Stinging hairs few and the plant spreading both by running rootstocks and seeds. Remedies: mowing in June and again in August; burning mature plants in autumn; grubbing or cultivation.

15. URTICASTRUM DIVARICATUM L. Wood Nettle. Star Nettle. (P. N. 3.)

Stem rather stout, erect, 2–3 feet high; leaves alternate, thin, ovate, long-stalked, sharply notched, pointed. Flower clusters large, loose; sepals and stamens of male flowers 5, sepals of female flowers 4, unequal. Achene ovate, flat, oblique, twice as long as the calyx.

Common in dense woods in rich soil and in moist shady places. July–Sept. Thickly clothed with stinging hairs. Remedies, same as for preceding species.

The Buckwheat Family.—POLYGONACEÆ.

Herbs or twining vines with alternate entire leaves, jointed stems and usually sheathing united stipules just above the swollen joints. Flowers small, regular, arranged in various forms of inflorescence; petals none; calyx free, often colored, 2–6 parted; stamens 2–9; ovary 1-celled with 2 or 3 styles and a single ovule. Fruit an achene, usually either triangular or 4-sided, often compressed and winged, usually covered by the persistent calyx.

About 35 species of the family grow wild in the State. Buckwheat and rhubarb or "pie-plant" are cultivated members. Our wild species are known as docks, smartweeds, knotweeds and bindweeds, and flourish in various localities. Many of them possess an acrid juice. The leaves of knotweeds are small and slender while those of smartweeds are larger and willow-like. The bindweeds have mostly arrow-shaped or heart-shaped leaves and twining or climbing stems. To the family belong two or three of our worst weeds and a number of others which are less troublesome.

16. Rumex acetosella L. Field Sorrel. Horse Sorrel. Red Sorrel. Sheep Sorrel. Sour-weed. (P. I. 1.)

Fig. 30. Male and female flowers shown on right above. (After Vasey.)

Stem slender, erect or nearly so, 6–15 inches high; leaves usually hastate and mostly from the root on long slender stems, 1–4 inches long. Flowers numerous, diœcious in whorls of 3–6, nodding and borne on a naked panicle; calyx reddish-green; pistillate flowers tipped with 3 tiny, crimson feathery stigmas. Fruit longer than calyx, not margined, covered with small granules. Seeds brown, triangular, 1/20 inch long. (Fig. 30.)

Common in old cultivated fields, meadows and pastures, especially those on sloping hillsides or with a sandy soil. May–Oct. Leaves very sour, often picked and eaten. Spreading by running rootstocks as well as by seed and often crowding out feeble growths of other crops. Its presence usually indicates a poor, light soil, where little else will grow. This dock should not be

confused with the yellow wood sorrel, often called "sheep-sorrel" (*Oxalis stricta* L.), which has clover-like leaves and belongs to a wholly different family. Remedies: use of lime or other fertilizers which will enable other plants, as clover or grasses, to grow and crowd out the sorrel; fertilizing and reseeding worn-out pastures and meadows with clean seed.

17. RUMEX CRISPUS L. Curled Dock. Sour Dock. Yellow Dock. (P. I. 1.)

Stem rather slender, erect, furrowed, simple or branched above, 1–4 feet high, springing from a long yellow spindle-shaped root; root-leaves oblong-lanceolate, heart-shaped or obtuse at base, long-stalked and with wavy-curled margins; those of stem short-stalked and smaller. Flowers drooping, borne in whorls on a long, leafless wand-like raceme; calyx dark green, the inner sepals large, heart-shaped, each with a tubercle on the back. Seeds brown, triangular, smooth, shining, 1/12 inch long.

Common along roadsides, fence-rows, in barnyards, dooryards and waste places generally. May–Sept. The root-leaves when young are often used for "greens" but the plant is an eyesore and a troublesome weed, difficult to eradicate on account of its long stout roots. Remedies: hand pulling, deep cutting or grubbing before the seed ripens; mowing several times during the season.

In England it is common and is referred to by Shakespeare in the lines:

"Nothing teems
But hateful docks, rough thistles, kecksies, burs."

The phrase "in dock, out nettle" is used as an incantation in Northern England. If a person is stung with a nettle the affected part is rubbed with a dock leaf, the phrase being several times repeated. The same words are there also much used to denote inconstancy or sudden change, whence the lines:

"Uncertaine, certaine, never loves to settle,
But here, there, everywhere, in dock, out nettle."

The roots of this and the next species, when collected in late summer or autumn, washed, split lengthwise and carefully dried, are used for purifying the blood and as a remedy in skin diseases. The price ranges from 2 to 8 cents a pound.

18. RUMEX OBTUSIFOLIUS L. Bitter Dock. Broad-leaved Dock. (P. I. 2.)

Resembles the preceding but has the lower leaves broader, ovate, more heart-shaped at base and the inner sepals with straight spine-tipped teeth on the margins and only one of them with an oblong tubercle on back. Seed slightly larger, darker and with a longer beak. (Fig. 31.)

Fig. 31. (After Vasey.)

Common in moist soil, especially that near the margins of lakes, ponds and marshes. July–Oct. Stems stouter than our other forms and when old very hard and woody. Seeds frequent in those of clover cut from lowlands. The leaves are often spotted with a reddish leaf-spot fungus and the heads are sometimes affected with a smut which destroys the seeds. Remedies: mowing before the seeds have ripened; hoeing, pulling and cultivating.

20. POLYGONUM PERSICARIA L. Lady's Thumb. Spotted Smartweed. Heartweed. (A. I. 2.)

Occurs in the same places as the curled dock, but less common. June–Aug. The seeds of both these docks are often found in clover and alfalfa seed which has not been properly cleaned. Where found in cultivated land, both can be eradicated only by short rotation or thorough cultivation with hoed crops.

19. POLYGONUM PENNSYLVANICUM L. Pennsylvania Smartweed. Glandular Persicary. (A. N. 2.)

Erect, simple or branched, 2–6 feet high, the flower stems with numerous glands; leaves lanceolate, pointed, 2–11 inches long. Spikes several, short, erect, cylindrical, dense flowered; calyx dark pink or rose color, 5-parted. Seeds lens-shaped, $\frac{1}{8}$ inch long, dark, shining. (Fig. 32.)

Fig. 32. Showing the flower opened and spread apart and the fruit with its two styles. (After Small.)

Stem erect or ascending, simple or much branched, glabrous, 6 inches to 2 feet high; leaves lanceolate, pointed at both ends, often with a tri-

angular dark spot near the center. Spikes solitary or in panicles, pink or dark purple, 1–2 inches long, oblong, dense-flowered, erect on smooth stems. Seeds heart-shaped or triangular, black, smooth, shining, 1/12 inch long.

Common in gardens, barnyards, waste places and cultivated fields, especially those of moist clover-lands. June–Oct. The name lady's thumb is given it on account of the dense oblong reddish spikes. According to Dr. S. A. Forbes it harbors the corn-root aphis, the louse appearing with the first leaves of the plant. Remedies, same as for the preceding.

21. POLYGONUM HYDROPIPER L. Common Smartweed. Water-pepper. (A. I. 2.)

Fig. 33. Showing the flower and the fruit with cross-sections of latter. (After Small.)

Stem erect, slender, simple or branched, often red or reddish, 8–24 inches high; leaves lanceolate, 1–4 inches long, marked with pellucid punctures. Spikes slender, weak, drooping, 1–3 inches long; flowers scattered, greenish-white; stamens 4 or 6. Seeds either lens-shaped or 3-angled, oblong, opaque or dull not shining, ⅛ inch long. (Fig. 33.)

Abundant in dooryards, barnyards, upland as well as lowland cultivated fields, ditches and borders of ponds. June–Oct. The leaves are very acrid and the juice when applied to the skin sometimes causes blisters or ulcers. Remedies: pulling or mowing; thorough cultivation.

The mild water-pepper (*P. hydropiperoides* Michx.), a perennial having the leaves narrower, not punctate, the stamens 8 and the seed shining, is often found with the preceding, while the swamp smartweed (*P. emersum* Michx.), also a perennial with much broader leaves and only 1 or 2 spikes of flowers, is common in moist lowlands. Altogether 12 species of true smartweeds are known from the State, but the five mentioned are the more widely distributed and the ones likely to be most troublesome.

22. POLYGONUM AVICULARE L. Knot-grass. Door-weed. Goose-grass. (A. N. 1.)

Fig. 34. Showing the flower and fruit. (After Small.)

Stem prostrate or suberect, slender, dull bluish-green, 4–18 inches long; leaves oblong or linear, ¼–¾ inch long, nearly sessile. Flowers axillary, in clusters of 1–5, small short-stemmed, greenish with white or pink borders; stamens 5–8. Seeds dull black, 1/10 inch long, 3-angled and minutely granular. (Fig. 34.)

Very common, forming mats of spreading, wiry, jointed stems in yards and along pathways and roadsides where the ground is much trodden; also in cultivated lands. June–Nov. This is one of the social weeds, such as plantain, burdock, catnip, etc., which accompanied the white man in his march across and conquest of the North American Continent. Holmes refers to it in the lines:

> "Knot-grass, plantain—all the social weeds,
> Man's mute companions, following where he leads."

An infusion of it was formerly supposed to retard bodily growth and is referred to by Shakespeare in the lines:

> "Get you gone, you dwarf;
> You minimus, of hindering knot-grass made."

The erect knot-grass (*P. erectum* L.) is also often found with the common form. It is erect or ascending, 1–2 feet high and has the leaves and often the flowers yellowish, the former 1–2 inches long. Both species are attacked by a mildew and sometimes by a smut.

Remedies: pulling or mowing before the seeds ripen; thorough cultivation with hoed crops; cement and concrete walks for yards.

23 POLYGONUM CONVOLVULUS L. Black Bindweed. Wild Buckwheat. (A. I. 1.)

Fig. 35. Showing the flower and fruit. (After Small.)

Stem twining or trailing, 6 inches–3 feet long, roughish, the joints naked; leaves ovate or arrow-shaped, pointed, long-stemmed, 1–3 inches long. Flowers in loose axillary clusters, greenish-white, drooping; calyx 5-parted, adhering closely to the achene which is 3-angled, black, granular, dull-pointed, ⅛ inch long. (Figs. 6, *a*; 35.)

Common in lowlands, especially in corn- and wheat-fields, where it often twines about and pulls down the stalks or weeds. June–Sept. The leaves and seeds are similar to those of buckwheat and the plant is distributed widely by overflow of the flood plains and by birds and the droppings of cattle. Remedies: mowing and burning before the seeds ripen; thorough cultivation with hoed crops; sowing clean seed; early fall plowing and harrowing to induce the seeds to sprout before winter.

24. POLYGONUM SCANDENS L. Climbing False Buckwheat. Bindweed. (P. N. 3.)

Stem climbing, 2–25 feet long, rather stout, branched. Leaves heart-shaped, pointed, 1–6 inches long. Flowers greenish-yellow, in numerous interrupted leafy panicles; calyx 5-parted, the three outer segments strongly keeled and in fruit winged. Seeds black, triangular, 1/6 inch long, blunt, smooth, shining.

Common in moist soil, along fence-rows, borders of thickets and cultivated fields, climbing high over fences, shrubs, brush piles, etc. July–Oct. The seeds are often

Fig. 36. Showing the flower and three-sided fruit. (After Small.)

found with those of clover, but are easily separated by proper screening. Remedies, same as for the preceding.

25. POLYGONUM SAGITTATUM L. Arrow-leaved Tear-thumb. (A. N. 3.)

Stem weak, 2–5 feet long, decumbent or climbing by recurved prickles which are numerous along its four angles; leaves arrow-shaped, pointed, nearly sessile, the stalks and midribs prickly. Flowers in dense terminal heads; sepals pale red with whitish margins, not keeled. Seeds triangular, dark red, smooth, shining, ⅛ inch long. (Figs. 8, *c*; 36.)

Borders of ditches, ponds and moist places generally. July–Oct. Mowers and haymakers in low ground are familiar with this weed, its sharp prickles being a sufficient excuse for its common name. Remedies: mowing and burning before the seeds ripen; draining and cultivation. The halberd-leaved tear-thumb (*P. arifolium* L.), differing in the leaves being hastate and the seeds lens-shaped, occurs with the preceding but is much less common.

THE GOOSEFOOT FAMILY.—CHENOPODIACEÆ.

Annual or perennial weed-like or homely herbs, with mostly alternate leaves. Flowers small, greenish, very numerous, variously clustered but usually in panicled spikes or solitary in the axils of the leaves; petals none; calyx 2–5 parted; stamens as many as or fewer than the lobes of the calyx and opposite them; ovary free from the calyx, 1-celled, 1-seeded. Fruit a utricle, the seed-vessel being surrounded by a loose, thin wall or bladder-like sac. (Fig. 14, *d*.)

Fig. 37. (After Vasey.)

Only about 16 species of the family grow wild in Indiana, but among them are several weeds which are rapidly spreading or occur throughout the State. The beet and spinach are cultivated members of the family. The common name, "goosefoot," refers to the shape of the leaves.

26. CHENOPODIUM ALBUM L. Lamb's Quarters. White Goose-foot. Pigweed. (A. I. 1.)

Stem pale green, often striped with purple, erect, usually much branched, 1–8 inches tall; lower leaves ovate, toothed or lobed; upper lanceolate, often entire; all white-

mealy beneath. Flowers in simple or compound terminal and axillary spikes; lobes of calyx strongly keeled, nearly covering the fruit. Seeds circular, lens-shaped, black, shining, 1/20 inch in diameter. (Figs. 6, *b*; 14, *d*; 37.)

Abundant in gardens, yards, waste grounds and cultivated fields, especially those in which corn, potatoes, etc., have been laid by. June-Oct. The name pigweed properly belongs to some of the members of the next family. The young plants and leaves are in some places used for "greens." The striped beet beetle* (*Systena tæniata* Say), both in the mature and larval stages, feeds upon it. It is also attacked by several species of fungi and in turn harbors the melon louse. Remedies: thorough and late cultivation with hoed crops; pulling or mowing and burning before the seeds ripen; harrowing growing crops of grain when the young cereals are about 3 inches high.

The maple-leaved goosefoot (*C. hybridum* L.), leaves without mealy scales, broad and shaped like a maple leaf, and the upright or city goosefoot (*C. urbicum* L.), leaves also without scales, broad, triangular and truncate at base, both occur frequently in streets, alleys, waste places and borders of fields. They are usually confused with lamb's quarters and should receive the same treatment. A fourth species, as yet listed only from Tippecanoe and Hamilton counties, is the nettle-leaved goosefoot (C. *murale* L.), also a European weed, whose leaves are ovate, thin, sharply and coarsely cut-toothed, the spikes shorter than the leaves and loosely panicled in their axils.

27. CHENOPODIUM AMBROSIOIDES L. Mexican Tea. American Wormseed. (A. I. 2.)

Stem ascending or erect, grooved, much branched, glandular-pubescent, strongly scented, 2–3 feet high; leaves oblong or lanceolate, edges undulate or entire, 1–4 inches long. Flowers in small dense, leafy axillary clusters; calyx 3-parted, completely enclosing the fruit. Seeds small, shining, kidney-shaped.

Frequent in streets, alleys and along river banks in the southern two-thirds of the State. July–Oct. Remedies the same as for lamb's quarters.

The wormseed (*C. anthelminticum* L.), a closely allied species, strongly scented and having the spikes in large leafless terminal panicles, occurs with the Mexican tea and is often confused with it. The essential oils from the seeds of both this and the Mexican tea are used as an anthelmintic or vermifuge, hence the common names of "wormseed." One or the other or both these species are, in

*The No. 2260 of the Indiana Catalogue of Beetles.

the vicinity of towns, the prevailing growth along the immediate sloping banks of the Ohio, Wabash and other streams. The seeds of both are salable at drug stores, the price ranging from 6 to 8 cents a pound. The oil distilled from the seeds is worth about $1.50 per pound.

28. ATRIPLEX PATULA L. Spreading Orache. (A. I. 2.)

Stem much branched, half erect, spreading, dark green, glabrous or somewhat scurfy; lower leaves lanceolate, slender-stalked, usually toothed or 3-lobed below the middle; upper ones linear, nearly sessile, often entire. Flowers in clusters arranged in interrupted leafy spikes, small, greenish, the two sexes separate; staminate flowers with a 3–5 parted calyx and the same number of stamens; pistillate ones without calyx, but with 2 more or less united leaf-like bracts at base which partly or wholly enclose the utricle. Seeds like those of lamb's quarters.

Fig. 38. (After Selby.)

Frequent along railway embankments, roadsides and in waste places and old fields, especially about cities and towns. June-Aug. This is an Eastern weed which is gradually spreading westward. In Indiana it has been recorded from Steuben, Hamilton, Marion and Tippecanoe counties and is very common about Indianapolis and Lafayette. The halberd-leaved orache (*A. hastata* L., Fig. 38) differing mainly in having the lower leaves only once or twice as long as wide, triangular with pointed lobes at base, is also recorded from Wells and Madison counties. Both form broad masses 1 or 2 feet high and often several feet in diameter. They are vile weeds of the same character as lamb's quarters and pigweed and when discovered should be destroyed at once. Remedies: pulling or deep hoe cutting before the seeds ripen.

29. SALSOLA TRAGUS L. Russian Thistle. Russian Cactus. (A. I. 1.)

Stem bushy-branched, ascending or spreading, 1–3 feet high and twice as broad, the outer branches and leaves usually bright red when full grown; leaves when young linear, 2 inches or more in length and ⅛ inch wide, spine-tipped; these replaced on the later flowering branches by sharp stiff spines in clusters of 3. Flowers purplish, solitary in the axils, with a spiny bract each side; calyx membranous, very strongly veined.

Seeds light yellow, conical, about the size of clover seed and usually covered with a gray coating. (Fig. 39.)

Fig. 39. *a*, branch of the mature plant; *b*, seedling; *c*, flower; *d*, flower viewed from above and in front; *e*, seed; *f*, embryo removed from the seed. (After Dewey.)

Occurs sparingly in the northern third of the State; there introduced by the trunk-line railways from the northwest, where it is a very troublesome weed in prairie grain fields. July–Sept. It is a tumble-weed, not a thistle, and when full grown becomes very large and spreading, forming a top from 2 to 6 feet in diameter. When broken off it is rolled over and over by the wind, scattering far and wide its many seeds. Remedies: pulling, spudding or uprooting before seeding; cultivating hoed crops until August; burning wheat stubble and other areas where it grows; sowing forage crops and pasturing with sheep. Farmers living along railways should keep an especial lookout for the Russian thistle and should destroy at once every strange weed which bears any resemblance to the description given. It is estimated that a single specimen produces from 20,000 to 30,000 seeds, so that if only one matures its seeds the farmers for miles around will suffer in a year or two.

The Amaranth Family.—AMARANTHACEÆ.

Homely herbs with alternate or opposite simple leaves. Flowers small, green or white, variously clustered, usually in terminal spikes or axillary heads and differing from those of the preceding family in being surrounded by thin dry and membranous persistent bracts which are often colored; petals none; calyx 2–5 parted, the parts usually distinct; stamens 1–5, mostly opposite the calyx lobes; ovary 1-celled. Fruit a utricle of which the cap comes away as a lid or bursts irregularly. (Fig. 14, *e*.)

Only 11 species of the family are known from the State, all of which are weeds of high or low degree. The showy coxcombs, prince's feathers and "love lies bleeding" of the flower gardens are cultivated representatives. The name *Amaranthus* means

"never fading" and was given these flowers by the Greeks on account of the dry unwithering nature of the showy bracts. In Europe they are regarded as emblems of immortality, a quality set forth by Milton in the lines wherein he speaks of the angels assembled before the Deity:

"To the ground,
With solemn adoration, down they cast
Their crowns, inwove with amaranth and gold.
Immortal amaranth, a flower which once
In Paradise, fast by the tree of life,
Began to bloom."

30. AMARANTHUS RETROFLEXUS L. Rough Pigweed. (A. I. 1.)

Stem stout, branched, light green, erect or ascending, 1–8 feet high from a pink tap-root; lower leaves ovate, long-stemmed, the upper lanceolate, pointed. Flowers green in dense sessile, terminal or axillary spikes which are often ½ inch thick; bracts awl-shaped, twice as long as the 5 oblong, spine-tipped sepals. Fruit or utricle thin, slightly shorter than the sepals, the top falling away as a lid. Seeds very small, round, lens-shaped, dark brown, smooth and shining.

Abundant throughout the State in gardens, waste places and cultivated fields. July–Oct. Occurring with the rough pigweed in gardens, and perhaps more common, is the slender pigweed or redroot (*A. hybridus* L., Fig 40.) It is also known as careless weed and differs in having the stem more slender, often purplish, and springing from a spindle-shaped purplish root, the leaves smaller, bright green, wavy margined and long stalked, and the spikes much more slender, not over ¼ inch thick, somewhat spreading or drooping. Both species are often attacked by a white mold that also attacks beets. The seeds of both ripen in early autumn, occur with those of grain and grass, and are blown far and wide over the snow. Remedies: shallow cultivation; thorough removal before seeding of the weeds in corn and potato fields and gardens; burning or pulling the seed-bearing plants from waste places, and from fields before fall plowing.

Fig. 40. *2* and *3*, flowers; *4*, utricle closed; *5*, same with lid off. (After Vasey.)

Fig. 41. (After Vasey.)

31. AMARANTHUS SPINOSUS L. Spiny Amaranth. Red or Spiny Careless Weed. Soldier-weed. (A. I. 1.)

Stem more branched and spreading, 1–4 feet high, often becoming red in age; leaves with a pair of stiff, sharp spines, ¼–1 inch long, in the axils. Flowers in both axillary clusters and terminal drooping spikes. Seeds round, lens-shaped, dark, very small, shining. (Fig. 41.)

Common in waste places, borders of fields, alleys and roadsides in the southern two-thirds of the State. June–Oct. Occurs especially in and near towns and cities along the Ohio and Wabash rivers Remedies the same as for the common pigweeds.

32. AMARANTHUS BLITOIDES Wats. Prostrate Pigweed. Low Amaranth. (A. I. 2.)

Stem prostrate or spreading, pale green, 6–24 inches long; leaves spoon-shaped or narrowed below into slender stalks. Flowers of this and the next species in small axillary clusters which are shorter than the leaf-stalks; bracts awl-shaped, but little longer than the sepals. Fruit a utricle opening by a lid as in the other species. Seeds rounded, lens-shaped, 1/16 inch in diameter, dark brown, shining.

Frequent along railways and in waste places in cities and towns. June–Oct. Spreading like purslane and often forming mats. Remedies the same.

33. AMARANTHUS GRÆCIZANS L. Tumble-weed. White Pigweed. (A. I. 1.)

Stem erect, bushy branched, whitish, 6–24 inches tall; leaves oblong, spoon-shaped, slender stalked. Flowers as in the prostrate pigweed, the bracts much longer than the sepals. Seeds one-half as large and with a distinct wing-like border.

Frequent throughout the State along roadsides, railways and in old fields. June–Oct. The leaves fall away in autumn and the branches bend in, forming a globular mass which is broken off and rolled along before the wind, thus widely scattering the seeds. One such weed, 5 feet 7 inches in circumference, was seen in Vigo County. From the Russian thistle, which has similar habits of seed distribution, this true tumble-weed may be known by its much wider leaves and small, round and shining seeds. Remedies the same as for the rough pigweed.

The Pokeweed Family.—PHYTOLACCACEÆ.

Tall perennial herbs, with large alternate ovate-oblong leaves and small flowers in terminal racemes, which by the farther growth of the stem become opposite the leaves. Petals none; sepals 4 or 5 white; stamens 10; ovary green, 10-celled, each cell with a single seed. Fruit a globose fleshy berry.

Only one member of the family occurs in Indiana, though 85 species are known, mostly from the tropics.

34. Phytolacca decandra L. Pokeweed. Poke-berry. Scoke. Pigeon-berry. Ink-berry. (P. N. 2.)

Stem stout, smooth, erect, branching, 3–12 feet high; leaves entire, 5–12 inches long. Berries in racemes like those of a grape, dark purple and filled with crimson juice. Seeds black, shining, roundish or kidney-shaped. (Fig. 42.)

This large well known weed occurs throughout the State in rich soil along the borders of old fields, fence-rows, roadsides, etc. June–Sept. Its reddish-purple stems, dark green leaves, clusters of white flowers and dark purple berries make of it a handsome weed—if a weed can be so termed. I have often found the small, shining black seeds beneath logs and stones where they have been carried by mice or shrews, and have frequently mistaken them for the heads of dead beetles. The stem springs from a large *poisonous* root, often 4–6 inches in diameter, and the young stems and leaves are sometimes used for greens or eaten like asparagus. If so used, care should be taken to separate all parts of the root and the water, in which the shoots are first boiled, should be rejected. The whole plant has a strong unpleasant odor and the pith of the hollow stem is in flat disks separated from each other by cavities. Remedies: grubbing or cutting below the top of the root; repeated mowing and salting.

Fig. 42. Flowering and fruiting branch. (After Chesnut.)

Both roots and berries of the pokeweed are used in medicine. A Kentucky boy whom the writer knew ate the berries for cramp in the stomach, claiming that they were a certain cure. If gathered for sale they should be collected in autumn and the clusters of berries dried in the shade, while the roots should be cleaned, cut crosswise into slices and carefully dried. They act upon the bowels and cause in time violent vomiting. Extracts made from them are used for itch, other skin diseases and rheumatism. The dried root brings from 2 to 5 cents and the berries about 5 cents per pound.

The Carpet-weed Family.—AIZOACEÆ.

Prostrate and branching herbs, with small whitish flowers borne in the axils of the whorled leaves. Petals none; calyx 5-parted; stamens 3–5; ovary 3-celled, forming in fruit a capsule which splits lengthwise. Seeds very small, kidney-shaped and marked with lines.

Fig. 43. Showing a flower and a cross-section of fruit. (After Britton and Brown.)

35. Mollugo verticillata L. Carpet-weed. Indian Chickweed. (A. N. 2.)

Stem spreading and forming circular mats, sometimes 2 feet in diameter; leaves in whorls of fives or sixes, spoon-shaped or linear, entire. Sepals oblong, white on the inner side, shorter than the egg-shaped capsules which are many seeded. (Fig. 43.)

Frequent in bare sandy spots, cultivated fields and gardens, and springing from the cracks between bricks in sidewalks. May–Oct. Remedies: pulling or hoe-cutting before the seeds ripen; sowing winter annuals after corn and potatoes.

The Purslane Family.—PORTULACACEÆ.

Fleshy tasteless herbs with entire leaves. Flowers regular, sepals 2; petals 4 or 5; stamens 5–20; styles 2–8 united below the middle. Pod 1-celled, with few or many seeds rising on stalks from the base. Only 6 species of the family are listed from the State, two of which, called "spring beauties," are among the earliest and prettiest of our springtime wild flowers. Here belongs also the cultivated portulaca and the following common garden weed:

26. PORTULACA OLERACEA L. Purslane. Pussley. (A. I. 1.)

Prostrate, smooth, freely branching from a deep central root; branches 4–10 inches long; leaves alternate, wedge-shaped, rounded at apex. Flowers pale yellow, sessile in the axils. Pods globular, opening by a little lid. Seeds very small, black, kidney-shaped, marked with a fine network. (Figs. 13, *c*; 44.)

Very common in gardens, dooryards and cultivated grounds, especially in sandy and rich soils. May–Nov. Flowers numerous, opening only in the morning sunshine, then closing once for all. In England purslane is used extensively as a pot-herb and for salads, and serves as does parsley to garnish dishes of meats, etc. Hogs everywhere are very fond of it. It is attacked by a white mold which in rainy seasons serves to keep it in check. Beneath its fleshy foliage it harbors insects of many kinds, among which are the melon plant louse and the corn-root louse. Onion and melon raisers have much trouble with it, as it grows rapidly and ripens its seeds after cultivation of the crops has ceased. Remedies: close hoe cultivation, especially very early and again late in the season; seeding with winter annuals after hoed crops.

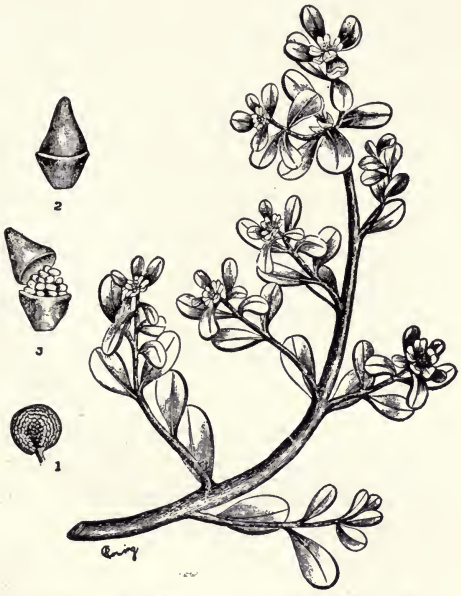


Fig. 44. *1*, seed; *2*, fruit or pyxis closed; *3*, same open. (After Vasey.)

THE PINK FAMILY.—CARYOPHYLLACEÆ.

Annual or perennial herbs with the joints of the stems often swollen and sometimes sticky; leaves opposite, entire. Flowers usually either solitary on long peduncles or numerous in flat-topped cymes; sepals 4 or 5, separate or united into a tube; petals as many as the sepals or none; stamens twice as many as sepals or fewer; pistils 1, 1-celled, the ovules united to a central column. Fruit usually a capsule opening by valves on the sides.

About 30 species of the family grow wild in the State, and mostly belong to two groups, viz.: (*a*) the cockles which have the sepals united into a tube, many of them being also called "catchflies," on account of the sticky or viscid secretions on joints of stems or calyx which they exude to prevent ants, small beetles and other honey-eating intruders which cannot pollenize from creeping up the stalks; (*b*) the chickweeds and sandworts, small white-flowered herbs abundant in woods and along the margins of lakes and streams, and having the sepals distinct or united only at the base. With us only 4 members of the family are as yet troublesome.

57. AGROSTEMMA GITHAGO L. Corn Cockle. Purple Cockle. (A. I. 1.)

Fig. 45. *a*, sprays showing flowers and seed capsule; *b*, seed three times natural size. (After Chesnut.)

Stem erect, 1–3 feet high, simple or with few erect branches, clothed with long, soft appressed hairs; leaves linear, acute. Flowers solitary on long axillary peduncles; petals pink or purple-red, showy; calyx-lobes linear, much longer than the petals. Seeds black, kidney-shaped, $\frac{1}{8}$ inch across, prettily marked with spiny ribs. (Fig. 45.)

Common in grain fields, especially those of wheat and rye; also along railways, fence-rows, etc. May–Sept. The seed contains a poisonous principle, and if bread be made of flour containing a high percentage of the ground seed it is often fatal to poultry and domestic animals, and in man produces a great irritation of the digestive organs. Remedies for the weed: hand pulling or spudding from the wheat fields intended for seed; careful screening of seed wheat, using a screen of 8 meshes to the inch; proper rotation of crops.

58. SILENE ANTIRRHINA L. Sleepy Catchfly. Tarry Cockle. (A. N. 2.)

Stem slender, erect or ascending, simple or branched above, 8–30 inches high; basal and lower leaves spoon-shaped, narrowed into a stalk, 1–2 inches long; upper leaves linear and gradually reduced to awl-shaped bracts. Flowers in a loose terminal cluster; calyx egg-shaped, much enlarged by the ripening pod, its teeth acute; petals pink, broader and notched above. Seeds dark brown, kidney-shaped, marked with rows of minute tubercles.

Frequent in light or sandy soils, especially in grain fields or waste places. Apr.–Sept. The stem is dark and viscid or sticky at or just below each joint and the flowers open for a short time only in sunshine. The seeds are frequent among those of clover or grass and in southwestern Indiana the plant is very common in wheat and rye. Remedies: sowing clean seed; pulling when not too common, to prevent the ripening of the seed; increased fertilization.

The sticky cockle or night-flowering catchfly (*S. noctiflora* L.) having 3 styles and large yellowish-white or pinkish petals, and the white cockle or white campion (*Lychnis alba* Mill.) with 5 styles and pure white petals, are two other members of the family recorded from the State which may develop into troublesome weeds, as they have done elsewhere. Both have sticky stem-joints and large blossoms which open only at night.

"In addition to the sticky gum the stem of these catchflies is more or less covered with fine hairs, both of which characters aid them in baffling unwelcome wingless visitors, while the long tubes of the corollas effectually keep out all flying insects except the few whose visits the plants desire. As if so many precautions were not enough the mouths of the tubes above the stamens are obstructed by five little valves or scales, one being attached to the claw of each petal. These scales can be easily bent down by the large and long proboscis of bees and moths but not by the little thieving flies against whose incursions the flowers are so anxious to guard themselves."—*Grant Allen.*

39. SAPONARIA OFFICINALIS L. Bouncing Bet. Soapwort. Hedge Pink. (P. I. 2.)

Erect, smooth, sparingly branched, 1–2 feet high; leaves ovate or oval, 2–3 inches long, 1 inch wide. Flowers large, showy, pinkish or white, in dense terminal clusters. Seeds black, smooth, kidney-shaped with a beak 1/16 inch long. (Fig. 10, *a.*)

Throughout the State, escaped from gardens and rapidly becoming an annoying weed, especially in sandy cultivated fields and along banks and railways. June–Sept. This buxom country cousin of the carnation spreads by underground stems and is therefore difficult to eradicate. The juice of the stem, when mixed with water, produces a soapy effect and has cleansing qualities, whence the generic name. Remedies: mowing twice each season for a year or two just before flowering; salting in early spring; cultivation, especially hoeing.

40. ALSINE MEDIA L. Common Chickweed. (A. I. 2.)

Spreading or half erect, tufted, much branched, 4–12 inches long; smooth except a line of hairs along the stem; leaves oval, ½ to 2½ inches long, the upper sessile. Flowers very small, white, the petals 2-parted, shorter than the calyx. Capsule egg-shaped, longer than the calyx; seeds brown, kidney-shaped, flattened, 1/24 inch across, the sides coarsely tuberculate. (Figs. 12, *h* and 46.)

Fig. 46. Showing flower, fruit and seed. (After Britton and Brown.)

Frequent in rich moist soil in gardens, lawns, meadows and pastures. Jan.–Dec. A winter annual, blooming at all seasons. In some places used as a barometer as it expands its flowers fully when fine weather is to follow but "if it should shut up, then the traveler is to put on his great coat." In Europe it is much used for feeding cage-birds, which are very fond of both seed and leaves. Remedies: early and thorough spring cultivation; reseeding lawns; crowding out by some winter-growing crop, as rye or crimson clover.

THE CROWFOOT OR BUTTERCUP FAMILY.—RANUNCULACEÆ.

Annual or perennial herbs with acrid sap; leaves usually alternate, often compound. Flowers with the parts all distinct and unconnected; petals 3–15, sometimes wanting, in which case the calyx is colored like the corolla; sepals the same number, often falling when unfolding; stamens numerous; ovaries 1–many, 1-celled, usually 1-seeded. Fruit of our weeds an achene. (Fig. 14, *f, g.*)

About 50 species of the family occur in Indiana. Among them are many of our common wild flowers of early spring and summer, as the liverworts, marsh-marigolds, larkspurs, columbines, baneberries, anemones, clematis, buttercups and meadow-rues. Most of these are harmless plants, covering the bare places of mother earth with their green leaves and posies gay. With us only one may as yet be listed as a weed, though others of its kind occasionally spread in low, wet pastures.

41. RANUNCULUS ABORTIVUS L. Small-flowered Crowfoot. Kidney-leaved Crowfoot. (B. N. 3.)

Stem erect, branching, glabrous; root-leaves thick, kidney- or heart-

shaped, long-stalked, toothed or crenate; stem leaves sessile, divided into 3–5 oblong or linear lobes. Flowers very small; petals yellow, oblong, shorter than the reflexed lobes of calyx. Head of fruit globose.

Fig. 47. Tall or meadow buttercup. (After Vasey.)

Common in moist soil, in woods, meadows, gardens, lawns and cultivated fields. March–Sept. Especially troublesome to strawberry growers and owners of well kept lawns. Remedies: pulling and hoe cutting; drainage; thorough cultivation.

The hooked crowfoot (*R. recurvatus* Poir.), having the kidney-shaped leaves all lobed and divided, the plant more or less pubescent and the beaks of the achenes strongly hooked, is also common in woods and pastures. The tall or meadow buttercup (*R. acris* L., Fig. 47), with the flowers large, showy yellow, 1 inch broad, calyx spreading and roots fibrous, occurs frequently in moist meadows and pastures and is in some States a pernicious weed. Its juice is very acrid and stock give it a wide range. Remedies the same.

The Mustard Family.—CRUCIFERÆ.

Herbs, mostly annual or biennial, with a pungent peppery juice; leaves alternate, usually narrow and deeply lobed, often forming a rosette at the surface of the ground, from which spring the slender flower-bearing stems. Flowers usually in racemes, white or yellow in color; sepals 4; petals 4, generally narrowed at base and placed opposite each other in pairs; stamens usually 6, 4 long, 2 short; pistils 1, 2-celled. Fruit a silique which varies greatly in form and size and bears numerous seeds. (Fig. 14, *i.*)

About 55 species of the family are known from the State, most of which are weeds. They may usually be easily recognized by the sepals and petals being in fours, in opposite pairs, thus forming a cross—whence the family name *Cruciferæ*. On the long racemes the flowers are usually to be found in all stages, from the unopened buds above to the ripened seed-pods below. When crushed the foliage often gives off a decided odor. Those which are weeds

occur mostly in grain fields, gardens, lawns and meadows. Many of the seeds have an oily covering which prevents decay and enables them to retain vitality for years. Cultivated members are cabbage turnip, cauliflower and radish.

42. LEPIDIUM VIRGINICUM L. Wild Pepper-grass. Tongue-grass. Canary-grass. (A. N. 2.)

Erect, smooth, much branched, 6–15 inches high; leaves tapering to base, the upper linear or lanceolate, entire; lower spoon-shaped, more or less notched on sides. Flowers small, white; stamens only 2. Pods small, rounded or oval, notched at tip; seeds light brown, flattened, 1/10 inch wide, half as long, egg-shaped with a very distinct border. (Fig. 48.)

Common everywhere in dooryards, waste grounds, fields and gardens. April–Oct. Very troublesome at times in clover, especially in light sandy soil after the first crop is cut; the seeds separable from those of the clover only by careful screening. Many of the seeds germinate in autumn forming flat rosettes with a single central tap-root, from which the flowers and seeds of early spring are produced. Sparrows of all kinds are very fond of the pods and eat vast numbers of them. Remedies: thorough and continuous cultivation; disc harrowing in late fall or early spring; hand pulling from lawns; spraying.

Fig. 48. Showing flower with 2 stamens, fruit and cross-section of latter. (After Britton and Brown.)

The apetalous pepper-grass (*L. apetalum* Willd.), basal leaves more cut-lobed and petals minute or wanting, and the field pepper-grass (*L. campestre* L.), downy or hoary pubescent, leaves clasping the stem, pod spoon-shaped, both occur in the State and will be more common. Remedies the same.

43. SISYMBRIUM OFFICINALE L. Hedge Mustard. (A. I. 2.)

Erect with rigid spreading branches, 1–3 feet high; leaves cut-lobed, the lower segments turned backward, the upper leaves nearly sessile. Flowers small, pale yellow. Pods slender, erect, awl-shaped, ½ inch long, pressed closely against the stem; seeds brown, oblong, cylindrical on back grooved on the other side, 1/16 inch long, one-third as wide.

Common in waste places and fallow or abandoned fields. April–Dec. The seed occurs in clover and grass seed and hay. Remedies: frequent mowing; increased fertilization and cultivation. It. as

well as the next two species, are hosts for the "club-root fungus" which attacks cabbage and turnips and all three should therefore be kept away from these vegetables.

Fig. 49. Tumbling mustard; *a*, base of stem of annual plant; *b*, one of the lower leaves; *c*, flower × 1½; *d*, branch with flower and pods. (After Dewey.)

Differing in having cream colored flowers and much longer, widely spreading pods is a closely allied species, the tumbling mustard (*S. altissimum* L., Fig. 49), a European plant which is a bad weed in the grain fields of Canada and the Northwestern States. In Indiana it has been recorded from six counties and will doubtless be found to be frequent in the northern portion, especially along the trunk line railways. The pods are 2–4 inches long and each one contains 120 or more seeds. On a single plant 12,500 pods were once counted, so that that plant alone produced 1,500,000 seeds. When the seeds are ripe the whole head of the plant breaks off and, as a tumbleweed, it may in winter be blown for miles, scattering a few seeds in many places. It is liable to be introduced anywhere in baled hay, and is especially liable to be found about elevators and railway yards. Isolated plants should be pulled before the seeds ripen. If in numbers they should be mowed or cut with hoe in June and again in August.

44. BRASSICA ARVENSIS L. Charlock. Wild Mustard. (A. I. 1.)

Erect, branching above, 1–2 feet high; rough with scattered stiff hairs; lower leaves stalked, cut-lobed; upper ones mostly sessile, feebly notched or entire. Flowers yellow, fragrant. Pods long, cylindrical, knotty, borne on stout stems and with a long two-edged beak which is empty or 1-seeded; seeds 15 or more in a pod, spherical, larger than those of the black mustard. (Fig 50.)

Frequent in the southern half of State, less so in northern counties. May–Sept. Occurs in meadows and grain fields, especially those of oats, the seeds remaining with them when threshed. The seeds have great vitality, often remaining buried for years or until conditions are right for successful growth. It grows very

rapidly and matures an immense number of seeds. Remedies: clean seed; surface burning in fall or spring; hand pulling and cultivation of hoed crops; spraying with iron sulphate (copperas) solution; harrowing stubble as soon as crop is cut to start a rapid autumn growth of the weed, then feeding off with sheep; harrowing young wheat in autumn after it has a good start.

Fig. 50. (After Vasey.)

45. BRASSICA NIGRA L. Black Mustard. (A. I. 3.)

Erect, tall, 2–7 feet high, prickly with short stiff hairs; lower leaves with a large terminal and 2–4 smaller lateral lobes. Flowers yellow. Pods erect, closely appressed to stem, 4-sided, smooth, ¾ inch long, ending in a slender beak; seeds dark brown, very pungent, 1/25 of an inch long, globular, finely pitted. (Fig. 51.)

Common in fields and waste places. June–Nov. Remedies same as for charlock.

The seeds of both this and the white mustard (*Sinapis alba* L.) when ground are used extensively in medicine for plasters, poultices, emetics, etc. More than 5 million pounds are imported each year, the price averaging about 5 cents per pound. The white mustard is a smaller plant, 1–2 feet high, flowers larger and paler yellow, the pods rough-hairy, with long, flat sword-shaped beaks; seeds pale yellow, smooth, larger and less pungent than those of the black mustard. In collecting the seeds for sale the tops should be pulled when most of the pods are ripe but before they begin to burst open, placed on a clean dry floor or shelf until fully ripe, then shaken over a sheet or canvas.

Fig. 51. (After Henkel.)

46. BURSA BURSA-PASTORIS L. Shepherd's Purse. Mother's Heart. (A. I. 1.)

Erect, branching, 6–20 inches high; lower leaves tufted, forming a rosette, cut-lobed or toothed like those of the dandelion; stem leaves few,

arrow-shaped. Flowers small, white. Pods heart-shaped or triangular, broad at top, notched at apex then narrowed to base, borne on slender stalks; seeds numerous, light brown, oblong, 1/20 inch in length, half as wide. (Fig. 52.)

Common everywhere in waste places, gardens and old cultivated fields. March 10–Nov. 25. A winter annual whose green rosettes are very pretty at that season, but whose spreading stems become an eyesore in early spring. It is also a host for the club-root fungus. At all times of the year and everywhere, when it is not actually freezing, this plant is growing. Each pod contains about 20 seeds. When put in water they, as well as those of most other mustards, produce a large amount of mucilage and a covering of rather long and very fine transparent hairs. This, by adhesion to passing objects, aids in their distribution. A single plant will ripen 20,000 of the seeds, so that it has enormous power of propagation. It will thrive anywhere, sometimes taking entire possession of the soil from which it draws a large amount of moisture.

Fig. 52. *a*, seed natural size; *b*, same × 6. (After Selby.)

Remedies: constant hoeing and cultivation; hand pulling from lawns; plowing or disk harrowing in late autumn; spraying with iron sulphate solution; cutting out the fall rosettes with hoe or spud.

The name "mother's heart" is common in England. The children hold out the seed pouch to their companions inviting them to "take a haud o' that." It immediately cracks, and then follows the triumphant shout "you've broken your mother's heart." In Switzerland the same plant is offered to a person with the request to pluck one of the pods. Should he do so the onlookers exclaim: "you have stolen a purse of gold from your father and mother."

The Rose Family.—ROSACEÆ.

Herbs, shrubs or trees with regular perfect flowers; leaves alternate, simple or compound, with stipules usually present. Calyx 5-lobed with the disc of the flower firmly attached; petals equal in

number to the calyx lobes and distinct, or none; stamens numerous, distinct; ovaries 1–many, 1-celled. Fruit of various forms, mostly capsules opening by a single valve, or achenes.

A large and important family which formerly included the apples, pears, cherries, etc. Recently, however, it has been divided into three families, the Rosaceæ as above restricted; the Pomaceæ, including the apples, pears, June-berries and red-haws; and the Drupaceæ, comprising the plums, cherries and peaches. To the Rosaceæ, as now defined, belong the meadow-sweets, raspberries, blackberries, strawberries, cinquefoils, avens, agrimonies, roses and many other forms. About 50 members of the family are known to grow wild in Indiana, but only a few of them intrude upon cultivated or pasture lands in such numbers as to be called weeds, and of those which do none belong to the weeds of the first class.

47. RUBUS ALLEGHENIENSIS Porter. Wild Blackberry. Common Brier. Bramble. (P. N. 3.)

Shrubby, branched, erect or recurved, 3–10 feet high, armed with stout recurved prickles; leaves compound; leaflets 3–5, ovate, pubescent beneath, coarsely toothed. Flowers white, terminal. Fruit a collection of small black drupes persistent on a fleshy receptacle, broadly oval, very pulpy.

This and several closely allied species of high blackberries are found throughout the State, being much more abundant on the hill slopes of the southern half. They occur mostly in poor clayey soil along roadsides, fence-rows and in old neglected fields and pastures, often taking complete possession of the ground. It is only where by neglect the bushes are allowed to spread that they become a nuisance and crowd out the blue-grass and other forage crops. A rust and numerous insects that prey upon cultivated berries are harbored by the wild canes, so that the two should not be allowed to grow in close proximity. Remedies: mowing several times in late summer; increased fertilization and cultivation.

Flowering in June, the fruit of the blackberry is ripe in July and August, and where desired for the table a few of the bushes are a valuable asset to the farm. These berries are the fruit of the earth, an offering of nature in her generous moods, her dessert of wild fruit, freely given, than which there is no better. Out of the clay and other materials of poor hillside soils the blackberry canes do fashion through the chemistry of their cells, this juicy pulp, sweeten it to our tastes, then offer it free for the taking. Is it not a miracle of nature, a miracle greater than any accredited to man, this juggling of earthy ingredients, this producing of luscious

berries by these thorny brambles? Moreover, they offer us a cure for over-eating, for a decoction made by steeping an ounce of the root in a pint of water is a valuable remedy in dysentery, cholera infantum and other bowel troubles.

However, it is not so much for humans as for birds that this fruit is produced by the blackberry canes. Each of the little fruits, which are clustered together around the fleshy receptacle, is in reality a nut which has clothed itself in an outer coat of sweet colored pulp. This pulp is a bonus which the plant throws in to induce the bird to swallow the nut. Within the nutlets, and protected by their hard indigestible stones or shells, are the true seeds which are scattered far and wide by the birds. The same plan of surrounding the nut by juicy pulp is seen in the peach, plum and cherry, where it is more evident to sight on account of the larger size of the nut or so-called seed.

The dewberry or low running blackberry (*R. procumbens* Muhl.) is very common in old meadows and dry upland fields in southern Indiana. Its long trailing stems often become mixed with the hay and so prove a great nuisance to haymakers and barefooted boys. Remedies the same.

48. POTENTILLA CANADENSIS L. Common Cinquefoil. Five-finger. (P. N. 3.)

Stems half erect or prostrate, 3 inches to 2 feet long, spreading by slender runners; leaves composed of 5 leaflets which are digitate or springing from a common point; these oblong, obtuse at apex, cut-toothed. Flowers axillary, solitary, yellow, showy; petals broadly oval; stamens about 20. Achenes numerous, smooth. (Figs. 9, *b*; 53.)

Fig. 53. (After Watson.)

Common in dry soils, especially in old "worn-out" fields in southern Indiana; much less so in the northern portions. May–July. Often called "wild strawberry," which its foliage closely resembles, but the fruit not fleshy. It is especially prevalent on sloping hillsides in company with the dewberry, blackberry, mullen, etc. Its presence indicates that the soil is sterile or lacking in some element of fertility. Remedies: fertilization and cultivation with forage plants, as clover or cow-peas; sheep-grazing.

The rough or tall cinquefoil (*P. monspeliensis* L.), stem 1–3 feet high, erect, rough-pubescent, leaflets 3, flowers small, yellow, numerous in terminal cymes, is frequent in moist soils throughout the State, being especially troublesome in clover fields. It flowers from June to August. Remedies: close cutting in spring or early summer; cultivation.

The Pea Family.—PAPILIONACEÆ.

Herbs, shrubs, vines or trees with alternate, mostly compound, stipulate leaves. Flowers butterfly-shaped, like those of the sweet pea, mainly in spikes, heads or racemes; calyx 4–5-toothed or cleft; petals usually consisting of a broad upper one (the standard or banner), two side ones (the wings), and two lower or front ones, more or less united (the keel); stamens 5–10, all united at the base into one group (monodelphous); two groups (diadelphous), or separate; ovary usually 1-celled, containing 1 to many ovules. Fruit a pod, 1 to many seeded, usually splitting into 2 valves. (Figs. 9, *c*, *d*; 11, *c*; 14, *k*, *l*.)

A large family, of which the peas, beans and clovers are familiar and important cultivated members. All have the fruit in the form of legumes or pods which vary much in size and shape. Rarely, as in alfalfa, they are coiled like snail shells; again they are like the achenes of buttercups but differ in opening down both sides to release the seeds. In one group, the trefoils and bush clovers, they are broken up into joints, each joint containing a single seed; in most species, however, they are like those of the pea or bean. To the farmer the members of the pea family are especially important, since they harbor on the roots bacteria which produce small nodules (Fig. 7.) enabling the plants to gather and store nitrogen from the air. It is this stored nitrogen which renders clover, cow-peas, etc., such valuable fertilizers. About 90 members of the family are known from the State, a half dozen or so of which may be classed as weeds.

49. Cassia marylandica L. Wild Senna. (P. N. 3.)

Erect or spreading, often branched, 3–8 feet high; leaves pinnate; leaflets 12–20, oblong, obtuse, 1–2 inches long; flowers not butterfly-shaped but nearly regular, yellow, showy, in upper axillary racemes; petals 5, nearly equal; stamens 10, separate, the upper 3 imperfect. Pod linear, curved, 3–4 inches long, ¼ inch wide. Seeds hard, gray, 3/16 of an inch long, half as wide. (Fig. 54.)

Abundant on moist hillsides, in lowland meadows and pastures and along sand and gravel bars in the southern half of the State;

less common northward. June–Sept. In the shape of the flowers the wild senna, partridge pea, red-bud, Kentucky coffee tree and a few others differ in that the upper petal or standard is enclosed by the wings in the bud, whereas in the pea family proper the standard overlaps or encloses the wings. The wild senna spreads by deep perennial roots and often densely covers large areas. Remedies: mowing before the flowers blossom, two or three times each season; cutting with hoe or spud and salting.

Fig. 54. *1*, flower; *2*, mature pods. (After Vasey.)

The partridge pea (*C. chamæcrista* L.) is another senna, which differs in its smaller size, much smaller leaflets which close when touched, petals often with a purple spot at base, and straight pods. It occurs in dry or sandy soil in the southern half of the State. Remedies: cutting and burning before the seeds mature.

50. MEDICAGO LUPULINA L. Black or Hop Medic. Prostrate Yellow Clover. Nonesuch. (A. I. 3.)

Branched at the base, the branches prostrate and spreading, 1–2 feet long; leaflets 3, clover-like, obovate or oval, crenate. Flowers small, bright yellow, in dense oblong heads or short spikes; stamens 10 in two sets, 9 and 1. Pods black, curved backward upon the stem, 1-seeded. Seeds yellow, similar to but smaller than those of red clover. (Fig. 55.)

Frequent in dry sterile soil along railways and roadsides and in waste places in towns and cities. May–Aug. Valued as forage, but much less so than the white and red clovers. An own brother to the alfalfa which belongs to the same genus, and its seeds

Fig. 55. (After Smith.)

often mixed with those of alfalfa and clover. Remedies: crowding out with red clover or cow-peas; increased fertilization.

51. MELILOTUS ALBA Desv. White Sweet-clover. White Melilot. Tree Clover. (B. I. 2.)

Erect or ascending, 3–10 feet high, branching; leaves 3-parted; leaflets oblong, slightly toothed, rounded at tip, ¾ of an inch long. Flowers white, in slender axillary racemes; standard slightly longer than the wings; stamens 10, in 2 sets, 9 and 1. Pod egg-shaped, ⅛ of an inch long. Seeds like those of red clover but smaller and flatter. (Fig. 56.)

Very common in hard, dry soil along embankments, roadsides, borders of fields and waste places generally. June–Oct. Sometimes forms dense thickets which, when the plants are old, are difficult to penetrate. Often cut and fed green to stock and in some parts of the south regarded as a valuable forage plant. If used for hay it should be cut early before the blossoms appear or the stem becomes too woody. Remedies: repeated mowing; cultivation in late summer; increased fertilization.

Fig. 56. (After Piper.)

The yellow sweet-clover (*M. officinalis* L.), 2–4 feet high, the flowers yellow, the standard about equalling the wings, occurs in similar places but is much less frequent. The leaves of both are fragrant in drying, hence the name "sweet-clover." Both are useful as soil indicators and where grown in old roadways or brickyards and then turned under aid much in bringing the dry soil into good condition.

52. MEIBOMIA CANESCENS L. Hoary Tick-trefoil. Seed Ticks. (P. N. 2.)

Erect, much branched, 3–5 feet high, covered with short dense hairs; leaves stalked, 3-parted; leaflets ovate, blunt-pointed, yellowish-green, 1–4 inches long, the end one the larger; stipules large, ovate, persistent. Flowers purple in terminal compound racemes; stamens in two sets, 9 and 1. Pod or loment lobed on both margins, more deeply below than above, 4–6 jointed, the joints longer than broad, very adhesive. Seeds lens-shaped, kidney-form, nearly ¼ of an inch long. (Fig. 57.)

Very common along fence-rows, roadsides, borders of thickets, etc., especially in low, rich soil. June–Sept. The joints of the pods break apart easily and are roughened with minute hooked hairs by which they adhere closely to wool, clothing and fur, thus widely scattering the enclosed seeds. Remedies: mowing or hoe cutting; cultivation.

Seventeen species of these tick-trefoils are known from the State, two or three of which are trailing, the others erect. All have purplish flowers and jointed pods, the joints varying much in number, form, size and adhesiveness. (Fig. 14, *l.*) All are vile weeds commonly known as "seed ticks," though no one of them is as common as the hoary species above described. Of them Thoreau has written: "Though you were running for your life they would have time to catch and cling to your clothes. They will even cling to your hand as you go by. They cling like babes to a mother's breast, by instinct. I have often found myself covered, as it were, with an imbricated coat of the brown seeds or a bristling chevaux-de-frise of beggars' ticks and had to spend a quarter of an hour or more in some convenient spot picking them off; and so they get just what they wanted, deposited in some other place. Growing on some rough cliff side, how surely they prophesy the coming of the traveler, brute or human, that will transport their seeds on his coat."*

Fig. 57. Single joint of pod shown below. (After Britton and Brown.)

The Spurge Family.—EUPHORBIACEÆ.

Herbs with a milky, acrid juice and small flowers, usually without petals, the sexes of which are often borne on separate plants or on different parts of the same plant; leaves variable in form, size, and position on the stems. Flowers, in most of our weeds, within or above a cup-shaped involucre of leaf-like bracts which are often colored, these involucres usually bearing naked glands. Fruit mostly a 3-lobed capsule, each cell of which contains a single seed.

A large family, mostly represented in the tropics. The castor-oil plant and various species of crotons, grown for their showy leaves and bracts, are cultivated examples. About 20 species grow wild in Indiana, several of them forming mat plants or disks of much branched vegetation similar to the carpet-weeds and purslanes but having a milky juice. Others are erect or suberect and all are separated mainly by the difference in shape and size of leaf,

*Autumn, 38–39.

smoothness or hairiness of stem and character of the surface of the seeds. Several of them are annoying weeds, especially in lawns, gardens and along walks. The milky juice of all spurges is said to "corrode and ulcerate the body wherever applied." As the flowering spurge is often gathered for decorations it is doubtless responsible for many cases of skin poisoning. Coulter states that he has a record of 23 such cases.

Fig. 58. Seed on left; staminate and pistillate flower surrounded by large lobed bract on right. (After Britton and Brown.)

53. ACALYPHA VIRGINICA L. Three-seeded Mercury. Wax-ball. Copper-leaf. (A. N. 2.)

Erect or ascending, 3 inches to 2 feet high; leaves dark green often turning purple, ovate, long-stalked, 1–3 inches long, thin, coarsely cut-toothed. Male and female flowers separate but in the same axillary cluster, the male or staminate ones included in a large leaf-like 5–9-lobed bract; the female ones at the base of these. Seeds ovoid, reddish-gray, 1/16 inch long with lengthwise wavy lines. (Fig. 58.)

Common in low, moist, shaded places and in rich or sandy soil, especially about barns and outbuildings. June–Oct. The seeds are easly crushed between the fingers, hence the name wax-ball. They are common in clover seed, from which they are difficult to separate. Remedies: pulling or cutting before the seeds ripen; thorough cultivation.

54. EUPHORBIA MACULATA L. Spotted Spurge. Milk Purslane. (A. N. 2.)

Stem more or less hairy, branched from the base, the branch slender, prostrate, spreading, often dark red, 2–15 inches long; leaves opposite, oblong, obtuse, very oblique at base, short-stemmed, usually with a brownish-red spot at center. Involucre entire. Seeds ovate, sharply 4-angled, 1/25 of an inch long, ash-gray with four shallow grooves across each side. (Figs. 6, *e*; 59.)

Fig. 59. Leaf and pistillate flower below; seeds above. (After Britton and Brown.)

Common in waste places, especially along gravelly or sandy banks, sidewalks, roadsides, in gar-

dents, etc. June–Oct. The plant often forms a handsome circular mat covering some naked place on the bosom of earth. Remedies: hoe-cutting or pulling when the first blossoms appear; thorough cultivation; burning mature plants.

A closely allied but less common species is the hairy, spreading spurge (*E. humistrata* Eng.), which has the involucre split on one side, stem more hairy, leaves larger, more ovate and more numerous.

55. EUPHORBIA NUTANS Lag. Large or Upright Spotted Spurge. Stubble Spurge. (A. N. 2.)

Stem ascending or erect with many side branches, reddish-green, 6–24 inches high; leaves opposite, ovate-oblong, often curved, unequally cut-toothed, often with reddish margins and a red blotch at center. Seeds blackish, oblong-oval, 1/16 inch long with blunt angles and cross ridges.

Common in dry pastures, along banks, roadsides and waste places, and especially in sandy stubble-fields. May–Oct. It is supposed to be one of the causes of the salivation or slobbering of horses, so often noted in late summer. The pods of it and allied species, when dry, burst with a snapping noise and project the seeds to a distance of several feet. Remedies the same as for the spotted spurge; also mowing or burning over stubble fields.

56. EUPHORBIA COROLLATA L. Flowering Spurge. White-topped Spurge. (P. N. 2.)

Erect, 1–3 feet high, branched above, bright green; leaves linear or oblong, the upper ones whorled, the others alternate. Flower stalks forked and arranged in an umbel at top of stem; involucres terminal, bearing 4 or 5 yellowish-green oblong glands and white petal-like bracts. Seeds gray, 1/10 inch long, slightly pitted. (Fig. 60.)

Fig. 60. (After Vasey.)

Frequent in poor, dry soils, especially along sandy banks and roadsides. May–Oct. When bruised it exudes a milky, poisonous juice. Spreads by long stout rootstocks as well as by seeds. Remedies: repeated mowings before the seeds ripen; increased fertilization; thorough cultivation until mid-summer.

The cypress or graveyard spurge (*E. cyparissias* L.) is a perennial, propagating by rootstocks, which as an escape promises to spread widely. It is often planted for ornament about country cemeteries where it grows a foot high in large patches. The leaves

are linear and the flowers in a terminal umbel. The bracts are yellowish when in blossom and the plant is poisonous to stock when eaten in quantity. Wherever found it should be destroyed by repeated cutting and salting as it crowds out grass and all other plants with which it comes in contact.

The Sumac Family.—ANACARDIACEÆ.

Shrubs or woody vines with acrid, often poisonous, milky sap and alternate, mostly compound leaves. Flowers in axillary or terminal panicles; calyx small, 5-parted; petals 5, greenish or yellowish; stamens 5; ovary 1, 1-celled, 1-seeded. Fruit generally a small drupe.

A small family with little or no economic value. Only six species are listed from the State, all sumacs belonging to the genus *Rhus*. Two of them produce a nonvolatile oil which is very irritating to the skin, producing blisters and ulcers. The other five are harmless to the touch. The foliage of one, the smooth sumac (*Rhus glabra* L.) is used to same extent in tanning leather. Another, the fragrant or sweet-scented sumac, grows only on rocky banks or cliffs and its foliage gives off a very pleasing odor. No other plants rival these harmless sumacs in the rich splendor of their leaves and fruits in the Indian summer of late autumn. Then

> "The maples blaze; the tangling sumac shrubs
> Of glowing spikes build crimson ladders up
> The wall."

They are then easily known by the red clusters of fruit, that of the poisonous species being grayish-white and the foliage much more dull.

57. Rhus radicans L. Poison Ivy. Poison Oak. Poison Vine. (P. N. 2.)

Stem woody, either climbing by numerous air rootlets, or bushy and erect; leaves 3-parted; leaflets ovate, pointed, entire or toothed. Flowers green in loose axillary panicles. Fruit grayish-white, smooth, globular, 1/6 of an inch in diameter. (Fig. 61.)

Common along fence-rows, borders of fields and thickets. May–July. Two well known varieties of poison ivy occur in the State. One is a bushy shrub 2–6 feet high and occurs most commonly about old fences and rocky ledges; the other is a vine 30–150 feet in length, climbing often to the tops of the tallest trees and found mostly in dry, open woods. The foliage of both is poisonous to most persons, though some can handle it with impunity. Birds feed readily upon the fruit and scatter the seeds far and wide. The poisonous oil is found in all parts of the plant, even in the

wood and roots. It is insoluble in water and cannot be washed from the skin with it alone. The best remedy for the poison is an *alcoholic* solution of sugar of lead. This is made by taking a small bottle of alcohol and putting in it as much of the powdered sugar of lead as it will dissolve. The milky fluid should then be rubbed into the affected skin three or four times daily. A water solution of sugar of lead will do no good and the alcoholic solution should never be taken internally as it is a deadly poison.

Fig. 61. *a*, spray showing aerial rootlets and leaves; *b*, clusters of fruit. (After Chesnut.)

Because the poison ivy is a vine of handsome foliage it is sometimes allowed to grow or is even transplanted about dwellings and parks. From the woodbine or Virginia creeper, also an ornamental vine with 5 leaflets, it can be at once told by having only *3 leaflets*. Any woody vine or low climbing shrub with 3 leaflets should at once be destroyed. Remedies: grubbing and burning, handling the parts only with hoe or fork, or employing men who are immune to do the work.

In the tamarack and other marshes of northern Indiana the second poisonous sumac (*R. vernix* L.) grows in abundance. It is a tall shrub or small tree with pinnate leaves of 7 to 13 leaflets and is, if anything, more poisonous than the 3-leaved ivy. The same remedy will cure the poison.

The Mallow Family.—MALVACEÆ.

Herbs or shrubs with alternate stipulate leaves. Flowers regular, perfect, often large and showy; sepals 5, united at base, often with a whorl of bractlets beneath the true calyx; petals 5, usually twisted in the bud; stamens numerous, united at base and connected with the base of the petals; ovaries several, arranged in a ring or forming a several-celled capsule.

A small family of innocent plants, possessing a mucilaginous juice, tough bark and having the flower stalks axillary and usually with a joint. They are easily known by having the bases of the stamens united in a tube which surrounds the pistils. The holly-

hock, cotton plant and okra are familiar or cultivated forms. The rose mallows which grow wild along the borders of marshes and streams produce some of the largest and most handsome of our wild blossoms. The most common one of these is the halberd-leaved rose mallow, 4–8 feet high and having the upper leaves hastate, the large bell-shaped flower pink with a purplish base and the fruit-pod surrounded by the bladder-like inflated calyx. Only a dozen species of the mallow family grow wild in the State, three of which are weeds.

58. MALVA ROTUNDIFOLIA L. Round-leaved Mallow. Low Mallow. Creeping Charley. Cheeses. (P. I. 2.)

Fig. 62. (After Clark.)

Stem branched at the base and spreading from a deep root, 4–12 inches long; leaves long-stalked, rounded or kidney-form, obscurely 5–9-lobed, the edges scalloped. Flowers clustered in the axils, pale blue, ½ inch broad; petals oblong, notched at the end, twice the length of sepals; ovaries about 15, rounded on the back, arranged in a disk. Seeds brown, kidney-shaped, 1/16 inch across. (Fig. 62.)

Common along roadsides and in dooryards, gardens and waste places in cities and towns. May–Nov. Children often eat the disk-shaped little fruit bodies, calling them "cheeses," whence the following lines:

"The sitting down when school was o'er
Upon the threshold of the door,
Picking from mallows, sport to please,
The crumpled seed we call a cheese."

Like other weeds which flourish best in compact or trodden ground this mallow has a long and tapering root. Remedies: pulling or deep cutting with hoe or spud in lawns and yards; thorough cultivation in gardens and fields.

59. SIDA SPINOSA L. Prickly Sida. Thistle Mallow. (A. I. 2.)

Erect, much branched, soft downy, 8–20 inches high; leaves ovate-lanceolate or oblong, scalloped, 1–2 inches long, the stems of the larger ones with a spine-like tubercle at the base. Flowers small, lemon-yellow, short-stemmed, axillary. Pods 5, combined into an ovate fruit, each splitting at the top into two beaks. Seeds dark brown, triangular, smooth, not shining, 1/12 inch long. (Fig. 63.)

Common in dry, upland, clayey soils in the southern two-thirds of the State, occurring especially along pasture pathways and roadsides and in dooryards and barnyards where the ground is compact. April–Nov. An emigrant from the south, this is fast becoming a common wayside weed. Often trampled upon by man and beast it yet survives and perpetuates its kind. Scrawny and rough in form it exemplifies a life of bitter struggle. Like the wire-grass, bravely it fights its way, raising its head with new vigor after being pressed closely to earth by many a passer-by. Remedies: cutting plants when they begin to blossom; in gardens, etc., cultivating with hoed crops.

Fig. 63. Showing flower and fruit. (After Britton and Brown.)

CO. ABUTILON ABUTILON L. Velvet Leaf. Indian Mallow. Butter Print. American Jute. (A. I. 1.)

Stout, erect, 3–6 feet high, densely clothed with short, soft hairs; leaves long-stalked, heart-shaped, pointed, 4–12 inches wide. Flowers yellow, solitary in the axils of the small upper leaves. Pods 12–15, pubescent, arranged in a circle to form a head 1 inch in diameter; when ripe opening at the apex which is split to form two short beaks. Seeds numerous, kidney-shaped, dark gray, $\frac{1}{8}$ inch across. (Fig. 64.)

Very common in gardens and cultivated fields, especially those of rich lowland soils in which corn and potatoes are grown. July–Oct. The leaves are in shape and size like those of the linn tree but are soft velvety in texture, hence the common name. The carpels or single pods are separated from each other by deep lengthwise grooves and the appearance of the ripe head has been aptly likened to that of a

Fig. 64. Showing flowers and circle of fruits. (After Vasey.)

circle of little milk pitchers set close together with their lips pointing outward. The many seeds are widely distributed by being blown over the snow and carried in hay and other crops. By some farmers it is considered one of the worst weeds with which they have to deal in bottom corn lands. Remedies: pulling or cutting before the blossoms appear; burning the mature plants before fall plowing; cultivation of hoed crops.

The bast, or inner fibrous bark, of this weed is a jute substitute which may be made into twine, rope and paper. In China the plant is cultivated for this fibre, which is exported under the name of China jute. The fibre from young plants takes dye readily and is fine enough to work into yarn for carpet fillings and coarse fabrics. Experiments in the cultivation and manufacture of the fibre have been made in Illinois and New Jersey. The cultivation was successful but the enterprises failed on account of the lack of economical machinery for extracting the fibre.*

The St. John's-wort Family.—HYPERICACEÆ.

Herbs or shrubby plants with opposite entire leaves which are always marked with glandular or small black dots, these pellucid when held against the light. Flowers in panicles or cymes at the end of slender stems; sepals 4 or 5, greenish; petals 4 or 5, yellow; stamens many, arranged in 3 or more clusters. Pod 1 to 5-celled with numerous seeds. About 20 species occur in the State, all natives but one, and it, like many other introduced plants, a vile weed.

Fig. 65. (After Vasey.)

61. Hypericum perforatum L. Common St. John's-wort. Herb John. (P. I. 3.)

Erect from a woody base, 1–2 feet high, much branched; leaves oblong or linear, sessile, less than an inch in length. Petals deep yellow with numerous black dots, twice the length of the lanceolate acute sepals. Pod 3-celled; seeds oblong, numerous, 1/20 inch long, surface with rows of pits. (Figs. 12, *d*; 65.)

Frequent in pastures and moist meadows. June–Sept. The crushed leaves are odorous and contain a very acrid juice. The name St. John's-wort was given it by the peasants of France and Germany who gather it with great ceremony upon St.

*Dodge.—"A Descriptive Catalogue of the Useful Fibre Plants of the World." 1897.

John's day and hang it in their windows as a charm against storms, thunder and evil spirits. In Italy it is known as the "devil chaser" because it scares away those who work in darkness by bringing to light their hidden deeds. It spreads by runners from the base and by seeds in hay, clover and grass seed. Remedies: cutting or pulling in meadows before mowing; digging or spudding; thorough cultivation with hoed crops.

The Evening-Primrose Family.—ONAGRACEÆ.

Herbs of varied size and appearance having the calyx tube united its full length with the ovary and often prolonged beyond it. Petals usually 4, twisted in the bud; stamens as many or twice as many as the petals and, with the latter, inserted on the top of the calyx tube; ovary usually 4-celled, with numerous ovules in each cavity. Fruit a capsule or small nut.

A family of medium size whose members have the leaves either opposite or alternate, and grow in various kinds of soil. The fuchsias, raised for ornament, are about the only cultivated forms. Among the 22 species listed from the State as growing wild are the water purslanes, willow herbs, fireweeds, evening-primroses, sundrops and enchanter's nightshades. Of these only one is common enough to be included in this book of weeds.

Fig. 66. Showing flower-buds, flowers, and seed-pods, the latter near the base. (After Kerner and Oliver.)

62. Onagra biennis L. Common Evening-Primrose. (B. N. 2.)

Stem erect, stout, usually unbranched, 1–9 feet high, often reddish; leaves many, lanceolate, pointed, unevenly and finely toothed, 1–6 inches long. Flowers in leafy bracted, terminal spikes, bright yellow, 1–2 inches broad; calyx tube slender, much longer than the ovary. Capsules oblong, narrowed above, erect, hairy. Seeds small, brown, roughened, angular, 1/32 inch long. (Figs. 11 *d*, *h*; 66.)

Common along streams and roadsides and in old, neglected fields, especially those with a sandy soil, sometimes crowding out all other growth and forming dense thickets. June–Oct. This primrose and the mullen are often found together on dry, sunny slopes, their petals vie-

ing with the evening sunshine in the brightness of their hue. Those of the former open only in late afternoon, but if the next day be cloudy or they are in the shade they often remain open until noon. They have a pleasing fragrance and by it attract unto themselves many night-flying moths. It is one of the few native weeds which has found its way to Europe in exchange for the many they have sent to us, and is said to be commonly cultivated in many English flower gardens. The first year it produces only a rosette of root leaves and is, therefore, a weed mostly in stubble or in crops sown in autumn, being especially notable in thinly seeded clover fields. Remedies: pulling, cutting or spudding in summer before the seeds ripen or in late autumn after the rosettes appear; burning mature plants; cultivation with hoed crops. When mown it is apt to stool and send up later stalks. Several successive mowings will, however, get rid of it.

The young shoots and roots of the evening-primrose are eaten as a salad in Germany. A tea made from the leaves is, in the eastern States, much used for dysentery, cholera morbus and other summer diseases of the bowels. In the East and South the young roots are also grated fine and mixed with fresh lard, butter or tallow to form a salve for burns, scalds, bunions, boils, felons, erysipelas, cuts, bruises, etc. In the South this salve is known as "King's cure-all" and by the negroes is used even for snake bites. The blossoms placed in water form a mucilage excellent for sore eyes.*

The Parsley or Carrot Family.—UMBELLIFERÆ.

Herbs usually with hollow stems and alternate, mostly compound leaves the stalks of which are often dilated at base. Flowers small, white, yellow, greenish or purple, borne in compound or simple umbels (Fig. 13, *e*, *g*); calyx tube wholly united to the ovary, its top truncate or with 5 small teeth; petals 5, inserted on the margin of the calyx; stamens 5, borne on the disk that forms the top of the ovary; ovary 2-celled, with 1 ovule in each cavity. Fruit composed of 2 seed-like dry carpels which are flattened or cylindrical and marked lengthwise with ribs.

A large and very difficult family some members of which have very poisonous roots or herbage. The flowers are much alike in all and the leaves very diversified, even in the same genus, so that the mature fruit is necessary for correct determination of the species. There are usually oil tubes in the fruit and the odor of cara-

*Vasey, "Report of U. S. Botanist," 1887, 311.

way seeds accompanies most of the fruits or mature seed pods. Thirty-two species of the family are listed as growing wild in the State, among them, besides the weeds below mentioned, being the cowbane, button snake-root, black snake-root, sweet-cicely, honewort, pennywort and that pretty little harbinger of spring, the turkey-pea or pepper and salt. The button snake-root differs from all the others in having the flowers clustered in dense bracted heads and the leaves lily-like. It is frequent in the wet prairies of western Indiana. Among the cultivated members of the family are the carrot, parsley, celery, parsnip, coriander, fennel and caraway.

63. DAUCUS CAROTA L. Wild Carrot. Queen Anne's Lace. Bird's Nest. Devil's Plague. (B. I. 1.)

Erect, bristly, 1–3 feet high, from a deep, fleshy conical root; lower and basal leaves 2 or 3 times divided, the smaller segments linear, toothed or lobed; upper leaves smaller, less divided. Flowers white, in compound umbels, which in age turn inward, forming a bird-nest-like cavity. Fruit bristly on the winged ribs. Seeds brown, ⅛ inch long, oval, prickly. (Figs. 1, *e*; 67.)

A handsome but vile weed which during the past 20 years has spread over most of Indiana. It occurs mainly along roadsides and in old neglected fields and meadows, especially in poor, dry upland soil, and is much more common in southern Indiana, where such soil is prevalent, than in the northern counties. June–Oct. It is the original form of the cultivated carrot and is a native of both Europe and Asia. The central flower of each umbel, and sometimes of each umbellet or little umbel, is often purple and the outer ones are sometimes partly or wholly pinkish. In the evening the flowers droop their heads and the young clusters of buds look especially weary, but in the morning all are standing up stiffly as if they had never thought of going to sleep. The seeds are very numerous, 50,000 having been counted on a plant of average size, and they are widely distributed by birds, railways, wind and water, so that if one slovenly farmer in a neighborhood allows the plant to grow all his neighbors will soon suffer for his neglect. Remedies: deep cutting with hoe or spud before blossoming; pulling when the ground is wet; increased fertilization; repeated mowing while in blossom. If mown

Fig. 67. Flower and fruit above. (After Vasey.)

but once they stool again and produce seed later on. By cutting with the scythe as often as they attempt to bloom all will be destroyed in two years. Badly infested meadows should be broken up and then planted to corn or re-seeded.

Fig. 68. Branch with umbel and leaf; *a*, flower; *b*, fruit; *c*, cross-section of fruit. (After Watson.)

64. HERACLEUM LANATUM Michx. Cow Parsnip. Masterwort. (P. N. 2.)

Stem very stout, erect, grooved, woolly, 4–8 feet high, often 2 inches thick at base; leaves divided into 3 leaflets which are rather thin, very pubescent beneath, broadly ovate, stalked, sharply toothed, 3–6 inches broad. Flowers white in compound umbels which are 6–12 inches wide. Fruit broadly oval, ½ inch long, ⅓ inch wide, notched at tip and with club-shaped oil-tubes extending only to middle. (Fig. 68.)

Common in the northern counties in low meadows and pastures and about the borders of lakes, ditches, etc.; less frequent southward. June–Aug. Remedies: repeated mowing or grubbing; cultivation.

65. PASTINACA SATIVA L. Wild Parsnip. Queen Weed. (B. I. 2.)

Stem erect, grooved, hollow, branching, 2–5 feet high, from a long conic fleshy root; lower and basal leaves pinnate or once divided, the segments thin, ovate, obtuse, sessile, sharply cut-toothed; upper leaves much smaller. Flowers yellow in compound umbels, without involucres, the rays and flower stems very slender. Fruit broadly oval, ¼ inch long, the ribs not prominent but the oil tubes conspicuous. Seeds whitish, thin, ¼ inch long.

Common in waste places, especially in moist grounds along railways, borders of marshes, roadsides, etc. June–Oct. The roots are poisonous even after cooking and are sometimes eaten by children with fatal results. Both it and the wild carrot harbor the celery fungus and neither should be allowed to grow anywhere near celery gardens. It is simply an escaped and degenerate form of the garden parsnip, which has become poisonous as a means of protection. Remedies: frequent mowing; cultivation with hoed crops; deep cutting with hoe or spud in late fall or early spring.

The meadow parsnips, *Thaspium trifoliatum* L., *T. aureum* Nutt. and *T. barbinode* Michx., resemble the wild parsnip but are much smaller, usually without grooved stems and with the fruit

not flattened. They occur frequently along banks, ditches and roadsides. Remedies the same.

66. CICUTA MACULATA L. Water Hemlock. Spotted Cowbane. Musquash Root. (P. N. 2.)

Stout, erect, branching, 3–8 feet high, the stem rigid, hollow, marked with purple lines, springing from several fleshy, oblong or spindle-shaped roots; leaves 2- or 3-divided, the lower long-stalked, often 1 foot long, the leaflets lance-oblong, coarsely and sharply toothed, 1–5 inches long. Flowers white in compound terminal umbels, the umbellets many-flowered. Fruit ovate, ⅛ inch long, with solitary oil tubes between the corky ribs. (Fig. 69.)

Occurs throughout the State in swamps, ditches and low wet grounds. June–Aug. It is one of the most poisonous native plants in the State, the roots being especially dangerous since they are aromatic, their taste suggesting that of parsnips or sweet-cicely. Both children and adults sometimes get hold of them where they have become exposed in some manner, and their eating results in almost certain death. Many cattle and sometimes sheep are also killed by eating the tubers or by drinking water which has become poisoned by the juices of the crushed roots. In spring when other food is scarce they browse over the wet lands, find the new green shoots and easily pull out the roots which look and taste like those of parsnip, so that they are very agreeable to stock. A piece of the root the size of a walnut is said to be large enough to kill a cow in 20 minutes. The symptoms of the poison in man are vomiting, colicky pains, staggering and frightful convulsions ending in death. When bruised the plant emits a disagreeable odor. Remedies: grubbing or cutting with hoe or spud in spring, then drying and burning the roots.

Fig. 69. Showing spindle-shaped roots and lower stem; also fruit and cross-section of seed. (After Chesnut.)

The poison hemlock (*Conium maculatum* L.) is another very poisonous species which has been introduced from Europe. It is also a large branching form with spotted stem and differs from the water hemlock mainly in growing in dry waste places and in

the fruit having no oil tubes. The juices from it furnished the poison of which Socrates was compelled to drink at Athens. In Indiana it has been recorded only from the southern counties.

Drugs made from the leaves and fruit of the poison hemlock are used in neuralgia, asthma and rheumatism. If collected for sale the leaves should be gathered when the plant is in flower, and the fruit just before ripening. The former should be dried quickly in the sun, the fruit more slowly in the shade. After drying both should be kept in tightly closed vessels. About 20,000 pounds of the seeds and 15,000 of the leaves are imported annually, the price ranging from 3 to 4 cents per pound for each.

The Dogbane Family.—APOCYNACEÆ.

Perennial herbs, shrubs or vines with entire, mostly opposite, leaves and a milky, acrid juice. Flowers solitary or borne in cymes or panicles; petals 5, united at base, twisted in the bud; stamens 5, alternate with the petals, inserted on the tube of the corolla; ovaries 2, distinct. Fruit usually a follicle opening at the side.

A large family but mostly represented in the tropics, the oleander and periwinkle being familiar cultivated forms. Only 5 species grow wild in Indiana. One of these is the periwinkle or blue myrtle, *Vinca minor* L., which has escaped from cultivation, and two others are weeds.

Fig. 70. *a*, flower; *b*, corolla split and spread to show base of stamens; *c*, stamens; *d*, tuft of hairs attached to seed. (After Dodge.)

67. Apocynum cannabinum L. Indian Hemp. Amy-root. (P. N. 3.)

Stem erect or ascending, glabrous, much branched, 2–3 feet high; bark tough, fibrous; leaves opposite, oblong or oval, short-stalked or sessile, 2–6 inches long. Flowers greenish-white in erect terminal many-flowered clusters; corolla bell-shaped, the tube not longer than the sepals. Pods (follicles) very slender, cylindrical, 4–6 inches long. Seeds brown, slender, tipped with a long tuft of silky white hairs. (Fig. 70.)

Frequent on slopes of old fields and along railways, roadsides and borders of thickets, especially in moist soil. July–Sept. It is often called the "small-leaved milk-

weed'' and its tough fibrous inner bark is easily separated from the straight stalks and is fine, long and quite strong. It is much used by the Indians for making bags, mats, small baskets, belts and twine for fishing-lines and nets. The milky juice is poisonous and the numerous rootstocks and wind carried seeds render its spreading easy. Remedies: hoe-cutting and salting; thorough cultivation; repeated mowing.

The spreading dogbane (*A. androsæmifolium* L.) is a near relative and is also frequent in dry soil along thickets and fence-rows. It is lower, 1–3 feet high, with more forking branches, wider leaves, larger and more showy rose-colored flowers in which the corolla tube is longer than the sepals. Remedies the same.

The Milkweed Family.—ASCLEPIADACEÆ.

Herbs or vines with milky juice and mostly opposite or whorled entire leaves. Flowers usually in umbels; calyx 5-parted, the tube very short or none; petals 5, more or less united; between corolla and stamens a crown of 5 hood-shaped nectar cups each containing an incurved horn; stamens 5, inserted on the base of the corolla; pollen grains cohering to form a pear-shaped waxy mass, two of which are united like little ''saddle-bags'' by a prolongation of their summits. (Fig. 11, *i.*) Fruit a follicle composed of two valves, opening on the side. Seeds compressed and usually bearing a tuft of long silken hairs.

A large family whose main distribution is in the tropics. In Indiana it is represented by 17 species, 11 of which are true milkweeds belonging to the genus *Asclepias*. They are perennial upright herbs with thick, deep roots and having the simple umbels of mostly purplish flowers borne on slender nodding stalks, which are either terminal or springing from the axils of the leaves. When a bee or other insect visits their flowers in search of honey its legs often become entangled in the grooves between the hoods and in attempting to escape a pair of the sticky pollen masses attach themselves to its feet. The bees and flies are often unable to free their legs and are held prisoners until they die. Three of these milkweeds are with us common enough to be termed weeds.

68. Asclepias tuberosa L. Butterfly-weed. Pleurisy-root. Wind-root. (P. N. 3.)

Stems erect, hairy, usually tufted, simple or branched near the top, 1–2 feet high, very leafy and with little milky juice; leaves alternate, oblong or lanceolate, sessile or short-stalked, 2–6 inches long. Flowers orange-yellow, showy, numerous. Pods hoary, erect on bent flower stalks. Seeds flat, broadly winged with abundant silky hairs.

Common in dry or sandy soil, along railways, roadsides and in neglected fields. June–Sept. One of the most handsome of our wild flowers, yet having a tendency to spread and crowd out more valuable plants. Remedies: grubbing or repeated cutting. Its bright orange hoods are very attractive to butterflies, especially the smaller blue ones known as "hair-streaks" and "coppers." Scores of these may sometimes be seen flitting about a bunch of the flowers. The root of the butterfly-weed is an officinal remedy for colds, bronchitis, pleurisy and pneumonia, the dose being from 20 to 40 grains of the powdered root, or a teacupful of the decoction made with half an ounce of root to a pint of water, taken several times a day. When properly dried it brings 5 to 6 cents a pound.

69. ASCLEPIAS INCARNATA L. Swamp Milkweed. (P. N. 3.)

Stem slender, glabrous, branched above, 2–5 feet high, leafy to the top; leaves opposite, lanceolate or oblong, pointed, 3–6 inches long, 1 inch wide. Flowers small, flesh colored, reddish or rose-purple, in numerous umbels, the hoods shorter than the slender needle-pointed horns. Pods erect, slender, 2–3½ inches long. Seeds brown, flat, broadly winged and with the usual tuft of hairs. (Fig. 71.)

Fig. 71. (After Dodge.)

Very common in marshes, ditches, low wet pastures and borders of lakes and ponds. July–Sept. The fibre of the stem is tough, finer than that of hemp, soft and glossy, and possesses greater strength than the majority of bast fibres of wild growth. It can be used for all purposes to which hemp may be applied. Binder twine made from it has stood a breaking test of 95 to 125 pounds. Since the plant grows best on lands subject to overflow or too wet to be cultivated for grain, it might, with the proper attention, prove as valuable a fibre-producing plant* as hemp and so bring in returns from otherwise waste ground. The root is also on officinal remedy for asthma, catarrh, rheumatism, etc. The plant may be killed by draining and grubbing or repeated mowings.

*Dodge.—"Fibre Investigations," No. 9.

70. Asclepias syriaca L. Common Milkweed. Silkweed. Wild Cotton. (P. N. 2.)

Stem stout, soft-downy, usually simple, 3–5 feet high; leaves opposite, oblong or oval, short-stalked, densely hairy beneath, 4–9 inches long, 2–4 inches wide. Flowers dull purple, the hoods short, obtuse with a tooth each side of the short horn. Pods robust, 3–5 inches long, the outside woolly and bearing numerous short soft tufts or warts. Seeds brown, flat, ¼ inch long, with an abundance of silky hairs. (Fig. 72.)

Fig. 72. (After Vasey.)

Common along roadsides, fence-rows and in blue-grass pastures. June–Aug. The milky juice is very plentiful, exuding whenever the leaves or stems are bruised, and is used by children as a remedy for warts. The root is used in medicine and when properly dried brings about 4 cents per pound. Where once started in a pasture the deep running rootstocks spread rapidly and send up numerous stems so that the area affected becomes much larger year by year. Remedies: repeated mowing or grubbing while in blossom; in cultivated lands, thorough hoeing and heavy cropping.

The Morning-glory Family.—CONVOLVULACEÆ.

Mostly twining, climbing or trailing herbs with alternate leaves and regular solitary or clustered axillary flowers. Sepals 5; petals 5, twisted in the bud, usually united their full length to form a large bell-shaped or funnel-form corolla (Fig. 10, *f.*); stamens 5, inserted low down on the tube of the corolla; ovary above and not united with the calyx, 2–4-celled with a pair of ovules in each cell. Fruit a 2–4-valved capsule.

A large family most abundant in the tropics, many of which are with us cultivated for ornament and one, the sweet potato, for its edible roots. Nine species, known as morning-glories and bindweeds, grow wild in the State, three at least of which are troublesome weeds. The glory of these wild morning-glories, how it entrances us! 'Tis a flower whose beauty is without a peer. The eye of each bloom is set deep within the tube of the corolla and beams out at us with an expression of most tender good will if we but deign to give it passing notice. They are goddesses of the night and early morn—born in the former—reigning in the latter and closing forever their evanescent eyes before the fiercer beams of the

noonday sun. God pity him who sees no beauty in a wild morning-glory, fresh from its natal bud!

71. IPOMŒA PANDURATA L. Wild Sweet-potato. Man-of-the-Earth. (P. N. 2.)

Stems long and stout, 2–12 feet long, trailing or twining from a huge fleshy root; leaves broadly ovate, pointed, heart-shaped at base, 2–6 inches long, sometimes constricted at sides so as to be fiddle-shaped. Flower-stalks long, 1–5 flowered; corolla funnel-form, 2–3 inches long, white or with purplish stripes in the throat. Capsule egg-shaped, 2–4 seeded, the seeds densely woolly on the margins. (Fig. 73.)

Common in dry or sandy soils, especially in river bottom fields, though often in uplands. May–Sept. The vine or visible part gives little sign of the great amount of available food stored in the fleshy root which is often two or more feet long and sometimes weighs 35 pounds. Such a root, buried deep in the soil, sends out many runners where the plant has fairly established itself and makes it very difficult to exterminate. Remedies: deep cutting and salting; repeated mowing for two or three years.

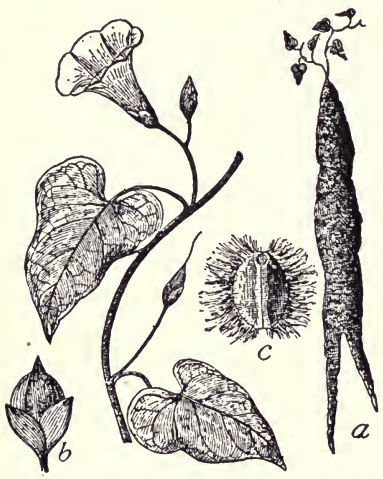


Fig. 73. Flowering branch; *a*, root; *b*, fruit; *c*, seed with woolly margins. (After Watson.)

The true wild morning-glories, of which there are three species in the State, are much less troublesome as weeds, though often occurring in numbers in lowland sandy fields. The most common of these are the small white-flowered species (*I. lacunosa* L.) with heart-shaped leaves and white corolla about ½ inch long, and the ivy-leaved morning-glory (*I. hederacea* Jacq.), the leaves deeply 3-lobed and flowers 1½ inches long, light blue or purple with white tube. Both are annuals and can be destroyed by pulling or cutting before seeding.

72. CONVOLVULUS SEPIUM L. Hedge Bindweed. Bracted Bindweed. Devil's Vine. (P. N. 1.)

Stems widely trailing or twining, 3–10 feet long; leaves slender-stalked, triangular or arrow-shaped, pointed, 2–5 inches long. Flowers about 2 inches long, solitary on long axillary stalks, pink with white stripes or wholly white; calyx with two large bracts ¾ inch long at base.

Capsule globose, 2–4 valved. Seeds dark without hairs, ⅛ inch across. (Fig. 74.)

Very common in cultivated bottom lands, moist uplands and along gravelly banks. June–Aug. It spreads by both seeds and creeping underground stems and is often called wild morning-glory or pea vine. From the annual morning-glories above mentioned this and the next are told by the flowers having two slender stigmas, whereas in them the 1 or 2 stigmas are globose or enlarged at tip. The bindweed often climbs up the stalks of corn or wheat and pulls them over, while potatoes and other low growing crops are literally smothered by its vines and leaves. Its rootstocks bear numerous buds and if cut up any small piece with a bud present will produce a new plant. Three remedies are given for its eradication in a recent bulletin,* viz., (*a*) Thorough cultivation every week or ten days between the spring and fall frosts, cutting out every piece of top growth that shows itself. (*b*) Pasturing with hogs which are very fond of the roots and rootstocks; the hogs of course should not have their noses ringed or slit, so that they may root deeply; if turned in just after the land is plowed the roots will be near the top and the hogs, if not furnished much other food, will go after them greedily. (*c*) Sowing the land to alfalfa, which not only tends to smother out the weed but by its necessary frequent cutting for hay serves in keeping down the top growth. The alfalfa should be followed by a cultivated crop to complete the work of eradication.

Fig. 74. (After Cox.)

73. Convolvulus arvensis L. Field Bindweed. Corn-bind. (P. I. 1.)

Resembles the preceding but the branches shorter, 1–3 feet long; the leaves smaller with the lobes at base more pointed and projecting. Flowers less than 1 inch in length, white or tinged with red; calyx without bracts at its base. (Fig. 75.)

In Indiana this introduced bindweed is much less common than the native species and occurs in dry, usually sandy or gravelly

*H. R. Cox.—Farm Bull. 368, U. S. Dept. Agr.

Fig. 75. Branch with flowers. (After Cox.)

soil, mostly in old neglected fields or along railways. May–Sept. It is propagated by spreading root-stocks, which form buds and send up shoots at close intervals. As with the hedge bindweed the top growth must be kept down and the roots starved out. Remedies the same; or, if in small patches, hoe cutting and salting.

The Dodder Family.—CUSCUTACEÆ.

Yellow or whitish twining parasites with very slender stems and leaves reduced to minute scales. Flowers small, mostly white, borne in dense clusters; calyx 5-lobed or 5-parted; corolla bell-shaped or cylindric, 5-lobed, the tube with small fringe-like scales between the lobes; stamens 5; ovary 2-celled. Fruit a 1–4-seeded capsule, or small globose pod, opening with a lid or bursting irregularly.

A small family of leafless annual herbs with thread-like twining stems, known as dodders or strangle-weeds, and parasitic on other herbs and shrubs by numerous minute suckers put out from the stem. All dodders are parasites by suicide. That is, each plant springs from a seed which furnishes it nourishment until it finds some suitable host about which to coil. In coiling it contracts and so pulls itself up by the roots. If not uprooted a portion of the stem a few inches above the ground soon withers, dies and breaks apart while the upper twining portion with its numerous minute suckers continues to flourish on the juices of its host.

If from the beginning one could trace its history he would doubtless find that like most other plants the dodder once had leaves but a weak stem, and desiring to reach the light began to twine. Tasting juices by chance it was nourished by them and so began a downfall which has continued until it presents the degraded spectacle of a plant without a root, without a twig, without a leaf and with a stem so useless as to be inadequate to bear its own weight. Other plants with smaller beginnings have gone on to higher forms but the dodder, from a breach of the laws of evolution, has paid one of nature's heaviest fines—lost the organs

which it once possessed and is a yellow creeping parasite almost its whole life long.

Six species of dodder are recorded from Indiana and several others doubtless occur. Two of these which are the most harmful are herewith treated.

74. CUSCUTA EPITHYMUM Murr. Clover Dodder. Devil's Gut. (A. I. 1.)

Stems thread-like, reddish-yellow. Flowers sessile in small dense clusters, pinkish-white; calyx more than one-half the length of the cylindric corolla tube; scales of the latter scalloped and strongly incurved. Capsule opening by a little lid. Seeds brown or dark ash-gray nearly spherical, finely pitted, 1/32 inch long or not larger than the smallest red-clover seeds. (Fig. 76.)

While this dodder is not recorded in the State list of plants it has been noted in Ripley and Putnam counties and doubtless occurs elsewhere in many clover fields as it is widely distributed east of the Mississippi and is well known in Ohio. Like all other dodders it depends wholly upon its host plants, the red clover and alfalfa, for food. Its stems spread from one clover plant to another, forming a dense mat-like mass close to the ground, the flowering branches meanwhile ascending and twining about those of the host. Their suckers soon reach and draw upon the juices, destroying the clover stems and leaves as if by fire. Even if torn loose small pieces of the plant will remain and form new centers of growth. Remedies: sowing clean clover seed. As Selby has well said: "Dodder in clover means that the dodder seed has been sown with the clover seed, and further that no clover seed should be saved from a dodder infested field."* The use of a sieve of 20 meshes to the linear inch, made of No. 30 to No. 34 Washburn & Moen gauge wire, will allow the seed of clover dodder to pass readily through, but will intercept all but the smallest of red clover and alfalfa seed. The separation of seed from this dodder is thus rendered very easy. Plowing and thoroughly cultivating the infested field is the only remedy where the dodder has gained a hold.

Fig. 76. *a*, flower; *b*, corolla spread apart to show scales on its inner side; *c*, mature seed-pod; *d*, seed and cross-section of same. (After Dewey.)

The field dodder (*C. arvensis* Beyr.) is also a common species

*Bull. 175, Ohio Exp. Sta., p. 348.

which preys upon both clover and alfalfa as well as many other plants. It is pale yellow, has the scales of the corolla tube fringed and the capsule bursts irregularly. Twining to the top of the clover stem or other host it throws out branches and rapidly spreads from plant to plant, often forming a dense yellow carpet of tangled threads which cover and weigh down the crop. The seeds are double the size of those of clover dodder and are therefore very difficult to separate from those of clover. They are gray, light brown or pale yellow in hue, rounded on one side and flattened or angled on the other.

Where found in small patches mowing or digging and burning is the only sure method of getting rid of this species. Where more widely spread, thorough cultivation should be used.

75. CUSCUTA GRONOVII Willd. Common Dodder. Onion Dodder. Wild Dodder. (A. N. 3.)

Stems bright yellow, slender, high climbing. Flowers short-stalked in dense clusters; corolla bell-shaped, lobes spreading, its scales thickly fringed about the summit of the tube. Capsule globose, short pointed.

Very common along streams and marshes, climbing high over many kinds of herbs and shrubs, occasionally also in dry upland fields. July–Sept. Often attacking onions grown in the muck soils of northern Indiana. Along the streams its yellow yarn-like stems cover large clumps of the water willow and gleam in the August sunshine like some great mass of gold dropped down along the lowest levels where the placid waters flow. Remedies: mowing and burning.

Other wild species there are, as the smartweed dodder, which attacks golden-rods and smartweeds; the button-bush dodder which preys mainly upon the shrub of that name, and the massive dodder whose hosts are the larger Compositæ like the sunflowers, the great ragweed and wild lettuce. Its flowers and stems are twisted together so as to form a rope-like mass sometimes an inch thick, whose coils encircle its hosts. All are confirmed parasites, sap-suckers of high degree, whose only redeeming quality is that some of them prey upon other weeds and thus aid somewhat in keeping in subjection these omnipresent foes of the farmer.

THE BORAGE FAMILY.—BORAGINACEÆ.

Chiefly rough hairy herbs with alternate entire leaves, and regular flowers borne mostly on one side of the branches of a spike or raceme which unrolls or straightens as the flowers unfold. Calyx 5-parted; corolla gamopetalous, 5-lobed; stamens 5, inserted

on the tube of the corolla and alternate with its petals; ovary deeply 4-lobed forming in fruit 4 hard seed-like 1-seeded nutlets standing close together within the calyx.

A rather large family of homely mucilaginous and slightly bitter plants, represented in Indiana by 20 or more species, among them, in addition to the weeds described below, being the wild comfrey, blue-bells, wild forget-me-nots, gromwells and puccoons. The heliotropes and true forget-me-nots are the only common cultivated forms.

76. CYNOGLOSSUM OFFICINALE L. Hound's-tongue. Dog Bur. Wool-mat. Gipsy Flower. (B. I. 2.)

Stem erect, stout, usually branched, leafy to the top, 1–3 feet high; basal and lower leaves oblong or tongue-shaped, slender-stalked; upper leaves lanceolate, sessile or clasping. Flowers reddish-purple or white, in panicles or more or less one-sided racemes; tube of corolla closed by 5 small scales. Nutlets triangular, flat on the upper face, covered with short barbed prickles. (Fig. 77.)

A vile ill-smelling weed common in dry soil along roadways, in shady pastures and waste places. May–Sept. The root leaves of the first season's growth form a dense tuft from the midst of which the flower stalk of the next season springs. The prickly burs adhere rather loosely to clothing and the wool of sheep. Remedies: deep cutting in late fall or early spring; repeated mowing before the seeds ripen.

Fig. 77. Corolla split and spread apart to show the stamens and scales in throat; fruit with 4 bur-like nutlets. (After Britton and Brown.)

The name *Cynoglossum* is the Greek for two words meaning "a dog" and "tongue," so given from the form of the leaves. In Europe, from whence the weed has been brought, it has been reputed to have the magical property of preventing dogs barking at a person if laid beneath the feet; and wild goats or deer, "when they be wounded with arrows, do shake them out by eating of this plant, and heal their wounds."

77. LAPPULA VIRGINIANA L. Beggar's Lice. Virginia Stickseed. (B. N. 2.)

Erect, much branched, 2–4 feet high; basal leaves broad, ovate,

long-stalked; stem leaves narrower, ovate-oblong, the uppermost sessile. Flowers small, nearly white, in racemes which are bracted only at base. Fruit globose, nearly 1/6 inch long, recurved; nutlets with margins and usually the back thickly armed with prickles.

Common in dry soil along borders of thickets, roadsides and in open woods and old fields. June–Sept. Occurring with it or in similar places and about as common is a European species, the blue bur or burseed (*L. lappulà* L.). It is an annual, 1–2 feet high, clothed with short gray hairs and with the leaves linear or oblong, sessile or stalked; the flowers pale blue, in leafy bracted 1-sided racemes, and the fruit not curved downward. Among the various fruits and seeds which rely upon animals for distribution, those of these two beggars' lice are most troublesome, being especially annoying to horses, dogs, sheep and man. They are easily known by being in groups of four and shaped somewhat like a quarter of an apple. The tip of each little prickle is barbed upward like a harpoon so that the burs are very difficult to remove from clothing. Remedies: pulling or mowing and burning; thorough cultivation; late fall or early spring plowing.

78. LITHOSPERMUM ARVENSE L. Corn Gromwell. Wheat Thief. Pigeonweed. Redroot. (A. I. 2.)

Erect, usually branched, 6–20 inches high, pale green clothed with appressed grayish hairs; leaves linear or lanceolate, sessile without veins. Flowers small, dull white, solitary and sessile in the axils of leafy bracts along the spikes; corolla tube not longer than the calyx, without scales or folds. Nutlets hard, brown, conical, 1/10 inch long, wrinkled and pitted. (Fig. 78.)

Fig. 78. (After Shaw.)

Common in the northern half of the State along railways, roadsides and in cultivated fields; less common but rapidly spreading southward. April–Sept. Prefers dry, more or less sandy soil, and where abundant especially harmful to winter wheat, rye, and meadows. The seeds often germinate in late autumn, the plant then being a winter annual, blooming and ripening the lowermost seeds the next spring before the winter cereals are cut. It is therefore very difficult to remove from grain fields. The seeds are frequent among those of wheat and hay and are also distributed by birds, threshing machines and

cattle. They are said to retain their vitality for years. Remedies: clean seed; burning wheat stubble in infested fields; if badly infested, plowing up the field in early spring; late fall plowing; pulling or cutting where occurring in small numbers.

79. ECHIUM VULGARE L. Blueweed. Viper's Bugloss. (B. I. 1.)

Fig. 79. (After Vasey.)

Erect, branched, bristly-hairy, 1–3 feet high; stem leaves oblong or lanceolate, sessile, entire, 2–6 inches long. Flowers bright blue, tubular, 2/3 to 1 inch long, numerous in short, 1-sided spikes; lobes of the corolla unequal. Nutlets ovate, $\frac{1}{8}$ inch long, wrinkled, their bases flat. (Fig. 79.)

A European weed as yet recorded only from the northern part of the State. Occurs along railways, roadsides and in waste places generally, especially in poor or gravelly soils. June–Aug. The numerous hairs harden with age and form sharp prickles which come off easily like the spines of a cactus. Being a biennial it forms the first year a dense rosette of long leaves lying flat on the ground, blooms only the second year, and is especially harmful to pastures and meadows. In Canada it is accounted one of the worst of pasture weeds. Like the Russian thistle it should be killed on sight. Remedies: deep cutting with hoe or spud in early spring; thorough cultivation when found in fields; repeated scythe mowing close to the ground.

THE VERVAIN FAMILY.—VERBENACEÆ.

Herbs or shrubs with opposite or whorled leaves and perfect flowers usually in spikes or heads. Calyx 4–5 lobed or cleft; petals united into a more or less two-lipped, usually cylindrical, corolla (this nearly regular in our weeds); stamens 4, 2 long, 2 short, inserted on the corolla and alternate with its lobes; ovary 2–4 celled, 1 ovule in each cavity. Fruit dry, usually splitting when ripe into 2 or 4 nutlets.

A large family, mostly represented in the tropics. Only 8 species are listed from Indiana, 7 of which belong to the genus

Verbena, the other being the fog-fruit, a low creeping form with only 2 nutlets, which grows along river banks and ditches. Four of them, known as vervains, are with us common enough to be classed as weeds, while another, *V. officinalis* L., is the European vervain or "herb-of-the-cross," introduced widely throughout the United States and occurring in southeastern Indiana. In Germany a wreath of this vervain is presented to the newly married bride, while in France it is gathered with secret incantations at different stages of the moon, and is then held to possess remarkable curative properties. It was formerly much used for love-philtres and charms, and it and the rue were the two plants most used in the mystic cauldrons of the witches This vervain was also among the sacred plants of the Druids and was only gathered by them "when the dog-star arose from unsunned spots." The reasons for the names "herb-of-the-cross" and "holy herb" are set forth in the following stanza:

"All hail, thou holy herb, vervin,
Growing on the ground;
On the Mount of Calvary
There wast thou found;
Thou helpest many a grief,
And staunchest many a wound.
In the name of sweet Jesu
I lift thee from the ground."

80. VERBENA URTICIFOLIA L. White Vervain. Nettle-leaved Vervain. (P. N. 2.)

Stem erect, slender, branched above, usually pubescent, 3–5 feet high; leaves ovate, mostly stalked, thin, pointed, coarsely saw-toothed. Flowers very small, white or purplish, borne on numerous erect or spreading very slender spikes. Seeds brown, slender, 1/20 inch long, with 1 curved and 2 straight sides.

Our most common species, occurring along roadsides, among rubbish about old buildings and in open pastures, usually in dry soil. June–Sept. It is very often covered with the leaf mildew fungus which gives it a sickly white hue and renders it an eyesore to every passerby. In blue-grass pastures it often forms dense patches, especially in the angles of old rail fences. Remedies: repeated mowing or grubbing; cultivation.

81. VERBENA HASTATA L. Blue Vervain. Simpler's Joy. Wild Hyssop. (P. N. 3.)

Erect, roughish, branched above, 3–7 feet high; leaves oblong-lanceolate, stalked, pointed, sharp-toothed, 3–6 inches long, the lower ones often hastate. Flowers bright blue in numerous rather slender erect spikes.

Fruit densely overlapping on the spikes. Seeds like the preceding but larger. (Fig. 80.)

Frequent in moist meadows and open sandy fields, waste places, etc. June–Sept. Sometimes associated with it, but more often in dry, open pastures, is the hoary vervain (*V. stricta* Vent.) densely soft, hairy all over, leaves nearly sessile, spikes stout, often a foot long, densely flowered, the corolla larger, deep purplish blue. In both the flowering begins at the base and progesses slowly upward so that often only an inch or two is in blossom at a time. When in the height of the blooming period the seed pods, or fruit of the past, are below; the unopened buds of the future above. Life, present work, is then centered in the flowering part; duty performed, work well done, in the seed part; promises or hopes for the future in the buds. Only the blooming part, that which is active, is then beautiful. Both plants are, however, in many places too plentiful and the farmer needs their room. Remedies: repeated mowing before the first blossoms appear; cultivation.

Fig. 80. Single flower on left; seed and fruit on right. (After Britton and Brown.)

The narrow-leaved vervain (*V. angustifolia* Michx.) is regarded as a bad weed in the eastern States, but with us has so far appeared in only 3 or 4 counties, where it occurs on prairies and in light sandy soil along high banks of streams. It is low, 1–2 feet high, with very slender or at most willow-shaped leaves and blue flowers in dense, slender spikes. Remedies the same.

The Mint Family.—LABIATÆ.

Chiefly aromatic herbs with 4-sided stems and simple opposite leaves. Flowers mostly in small clusters, spikes or racemes from the axils of the leaves; corolla with a short or long tube, more or less 2-lipped; upper lip usually 2-lobed, lower, 3-lobed; stamens usually 4, 2 long, 2 short, sometimes only 2, borne on the tube of the corolla; ovary deeply 4-lobed, forming a fruit of four 1-seeded nutlets in the bottom of the persistent calyx.

A family of about 3,000 species, of wide distribution in temperate and tropical regions. The foliage is dotted with small

glands containing a volatile oil which yields the aroma or spicy fragrance common to most members of the family. If the plant belongs to the mint family, by rubbing one of the leaves between the fingers one can easily detect an odor akin to that of catnip or pennyroyal. If in addition the stem is 4-sided and the nutlets 4 its location there is certain. Here belong the sage and lavender, bergamot and hoarhound, thyme and sweet majorum, balm and savory, sweet basil and hyssop of our country gardens. Here also belong about 65 species growing wild in the State, among them, in addition to the weeds below mentioned, being skull-caps, giant hyssops heal-all, dragon-head, hedge nettles, horse mints, wild basils, field balms, mountain mints, pepper-mints and bugle-weeds. Mint extracts, distilled from the foliage of certain species, are used in perfumery, confectionery and in medicines and a number of the wild forms are gathered as household remedies. While a half dozen or more of the family are weeds in that they are useless plants, no one of them possesses that dominant intrusive character which marks a weed of the first class.

Fig. 81. *a*, branch with flower clusters; *b*, side view of a few flowers; *c*, bilabiate or two-lipped flower, enlarged, showing the united sepals, the three divisions of lower lip and two of upper, the stamens and style protruding through the slit of upper lip. (After Briquet.)

82. TEUCRIUM CANADENSE L. Wood Sage. American Germander. (P. N. 3.)

Stem stiff, erect, downy, somewhat branched, 1–3 feet high; leaves lanceolate or oblong, short-stalked, pointed, sharp-toothed. Flowers ⅜ inch long, pinkish or purplish in terminal bracted spikes; corolla tube short, the upper lip 2-lobed; stamens 4, exserted. Nutlets rough, attached by the sides. (Fig. 81.)

Common in grass lands along the borders of streams, marshes, moist thickets and fence-rows. June–Sept. The ovary is only 4-lobed, not divided into 4 nutlets as in the other mint weeds treated below, and the stamens protrude from the cleft between the lobes of the upper lip. Remedies: mowing and grubbing.

83. NEPETA CATARIA L. Catnip. Catmint. (P. I. 2.)

Stem erect, rather stout, branched, pale green, very downy, 2–3 feet high; leaves ovate or heart-shaped, deeply scalloped, paler beneath. Flow-

ers in whorled clusters about the spikes at the ends of the stems and branches; corolla whitish dotted with purple, strongly 2-lipped, the upper lip concave; stamens 4, the upper pair the longer. Nutlets egg-shaped, brown, smooth, 1/16 inch long, the basal scar with a white eye-like cavity each side above.

This is one of the best known of the social weeds being very common about the sites of old dwellings, along roadsides and in waste places in rather dry soil. June–Oct. It is a native of both Europe and Asia, and a tea made from its dried leaves is used the world over by old ladies who deal in simples as a mild stimulant and tonic for colic in infants, hysteria, etc. The flowering tops and leaves have a strong mint-like odor and a bitter taste and are sold by druggists. If gathered for sale they should be collected when the plant is in flower and then carefully dried. The price ranges from 2 to 8 cents per pound.

The common name was given the plant on account of the old belief that cats "are much delighted with catmint, for the smell of it is so pleasant unto them that they rub themselves upon it and wallow or tumble in it and also feed upon its branches greedily." That cats do eat the leaves the writer knows by having seen them, but only the cats know why, and they will forever keep the secret. Perhaps they suffer from cat-colic and eat the catnip as a cure. As a weed on the farm the catnip is spreading both by seeds and rootstalks and it gives the waysides and barnyards a slovenly appearance. Remedies: repeated mowing before the seeds ripen; digging or close hoeing.

84. GLECOMA HEDERACEA L. Ground Ivy. Gill-over-the-Ground. (P. I. 2.)

Stem creeping or trailing, 12–18 inches long, with upright flowering branches; leaves rounded or kidney-form, broadly scalloped, long stalked. Flowers in loose axillary clusters; corolla blue or violet, twice the length of the calyx, 2-lipped; stamens 4. Nutlets brown, smooth. (Figs. 8, *f*; 82.)

A common and very pretty trailing herb occurring in shady grasslands, especially along borders of thickets, roadsides, fencerows and in back yards. March–Oct. In rich moist soil it often forms a dense growth of leaves and stems above ground and rootstocks below which crowds out the blue-grass and other forage plants. In such places its leaves remain green all winter and its

Fig. 82. *a*. a. flower. (After Watson.)

flowers have been seen as early as March 18. Then, while sitting on an old log, I have had

> Ivy flowers beside me peep
> Upward through the ether blue,
> Seeing stars which ever keep
> Hidden close from human view.

It is common in Europe and among the Swiss, when worn on the person in company with rue, agrimony, maiden-hair and broom-straw, is thought to confer fine vision and to point out the presence of witches. The foliage was used in England until the time of Henry VIII to clarify and give a flavor to ale, but at that period was replaced by hops. The odor of the leaves is exhaled freely and is strongly penetrating and peculiar, yet pleasing to him who, through long experience, has learned to expect it on his daily walks. The plant is very difficult to eradicate, and where found in lawns and yards, resodding or spading and reseeding must be done, while in fields fences should be removed and thorough cultivation used.

85. LEONURUS CARDIACA L. Motherwort. (P. I. 2.)

Stem rather stout, erect, somewhat branched, 2–5 feet tall; lower leaves rounded, slender-stalked, 2–5 cleft. Flowers in dense whorls, in the axils of the narrower 3-cleft upper leaves; calyx teeth spiny-tipped; corolla pale purple, upper lip concave, white woolly, lower one purple dotted; stamens 4, the lower or front pair the longer. Nutlets 3-sided, 1/12 inch long, dark, smooth. (Fig. 83.)

This is another common social weed, occurring about the sites of old houses, barnyards, fence-rows and waste places in dry or sandy soils. June–Sept. Like the catnip and ground ivy it was brought from Europe, but is more unsightly and useless than either of them. It was once much used in nervous and hysterical complaints and an infusion of its leaves taken at bedtime is said to produce sleep. In March one often sees standing stiffly erect, like brown monuments of the past, the 4-angled stems of last year's motherwort. On them the dry fruit is in dense sessile clusters an inch and a half apart, 8 to 10 of these clusters along the tapering spike. From 6 to 12 fruits are in each cluster and from each 5 needle-pointed spines project,

Fig. 83. Corolla split and spread to show lower lip and 4 stamens; fruit on left above, calyx on right. (After Britton and Brown.)

the calyx teeth of last year's flowers. A sure protection they give the enclosed nutlets from seed-eating bird and inquisitive human, until the old stem is ready to fall to earth. Then the nutlets are loosened and soon up from them new plants spring, the old winter one having been to them a literal "mother-wort." Remedies: cultivation; repeated cutting with hoe or spud and salting.

86. LAMIUM AMPLEXICAULE L. Henbit. Dead-nettle. (A. I. 2.)

Fig. 84. (After Atkinson.)

Stems slender, weak, branched from base, somewhat spreading, 6–18 inches long; lower leaves rounded, scalloped, slender-stalked, upper ones sessile, clasping. Flowers few, in axillary and terminal clusters; calyx teeth long, erect, not spiny-tipped; corolla purplish, small, slender, tubular, upper lip bearded, lower one spotted. Nutlets gray with whitish markings, curved, 3-sided, 1/20 inch long. (Fig. 84.)

Frequent in southern Indiana, less so northward. Occurs around dwellings in lawns and gardens and along roadsides and borders of fields. March–Oct. In most places a winter annual, forming its root-leaves in late autumn, flowering and ripening its seeds in early spring. Remedies: in lawns, deep cutting or hand pulling; in fields, thorough cultivation; crowding out with clover or other winter growing crop.

87. STACHYS PALUSTRIS L. Common Hedge Nettle. Rough-weed. (P. N. 2.)

Stem erect, slender, rough-hairy, somewhat branched, 1–4 feet high, the angles with stiff down-pointed hairs; leaves firm, lanceolate or oblong, sessile or short-stalked, toothed, pointed. Flower clusters in an interrupted spike, 6–10 flowers in a whorl; corolla tube not longer than calyx, purplish or pale red, purple-spotted, the upper lip pubescent; stamens as in motherwort. Nutlets egg-shaped, rounded above. (Fig. 85.)

Fig. 85. Single flower above; stamen below. (After Britton and Brown.)

Abundant in moist soil along ditches and streams and in marshes. June–Sept. The rough hedge nettle or woundwort (*S. aspera* Michx.) occurs in similar places and differs

mainly in having the leaves wider and slender-stalked, the corolla and calyx less hairy. Both are homely weeds which for the most part occupy unused ground and therefore do little harm. Remedies: draining and then mowing for a year or two; cultivation.

88. HEDEOMA PULEGIOIDES L. Pennyroyal. (A. N. 3.)

Stem slender, erect, much branched, finely and softly hairy, 6–18 inches high; leaves ovate to oblong, thin, short-stalked, few-toothed. Flowers in small rather loose axillary clusters; teeth of upper calyx lip triangular; corolla bluish-purple with darker spots, ¼ inch long, the upper lip notched; perfect stamens only 2. Nutlets egg-shaped, finely wrinkled, 1/32 inch long. (Fig. 86.)

A strongly aromatic and well known little herb, very common in old fields, open upland wooded pastures, along fence-rows and about old stumps. June–Oct. The average stem of pennyroyal bears 12 whorls or clusters of flowers, each whorl having 8 to 10 flowers. Counting 100 flowers to the stem and 4 seeds to the flower, each plant produces at least 400 seeds. When it grows thickly there are at least 40 stems to the square foot, so that we have 16,000 seeds of a single plant produced on each square foot of surface. Thus do the wild things of nature hold their own. A myriad are where one is yet to be.

Fig. 86. *a*, two-lipped flower; *b*, leaf. (After Watson.)

When the rambler through some old pasture in southern Indiana seats himself beneath the shade of oak or maple on a summer day the first thing to greet him is usually the odor of pennyroyal. The blossoming plant is then everywhere abundant on the clay lands of the woodland slopes. From the half sterile soil its rootlets gather in the elements of the essential oil which exhales the penetrating odor. Within the cells of leaf and stem those elements are sorted and combined and by a process of chemical changes the oil is there produced. The odor is so strong and lasting that it readily survives the winter and in March or April, in places where the plant has grown, it is mingled with that of the earth mold of spring to form a pleasing fragrance.

An infusion of the leaves of pennyroyal is much used as a popular remedy to promote perspiration, as a cure for colic and a carminative, and may be taken freely without much regard to quantity.

Notwithstanding its fragrance and its medicinal value the plant is much too common in places where the blue-grass ought to grow and is therefore included among this list of weeds. Remedies: in pastures, mowing; burning over in autumn; in fields, increased fertilization and fall plowing.

89. MENTHA SPICATA L. Spearmint. Common Mint. Our Lady's Mint. (P. I. 3.)

Erect, branched, glabrous, 12–18 inches high, spreading by leafy runners; leaves lanceolate, sessile or short-stalked, pointed, sharply toothed. Flowers in dense whorls in narrow terminal, usually interrupted bracted spikes, the bracts linear, awl-pointed, often longer than the flowers; corolla regular, pale purple, 4-cleft; stamens 4. Nutlets egg-shaped, smooth.

Very common in low wet places, especially about springs and in lowland pastures along streams. June–Sept. Along the borders of rippling streams, and often from the shallow water, spring the stems of this lowly, pungent semi-aquatic herb and its brother the peppermint. In the centuries that have gone by how many stomach-aches, both of babies and mature humans have their juices cured? At the base of damp shady banks in old woodland pastures they have their favorite abiding places. There their fragrance permeates unheeded the surrounding air. Do browsing cattle ever suffer from the stomach-ache and find relief in the juices of their stems and leaves?

Fig. 87. Peppermint; *a*, flower; *b*, calyx. (After Watson.)

Both the spearmint and the peppermint (*M. piperita* L., Fig. 87) were introduced from Europe, but the former seems to be the more aggressive and wide spreading. It is the species used in making that well known and seductive beverage of the southern States known as "mint julep." It is also used extensively in medicine and extracts, but much less so than peppermint, the latter being cultivated extensively in the muck soils of northern Indiana, Michigan and elsewhere for its essential oil. Both spread freely by underground stems which send up buds at short intervals, and where too plentiful can be kept in check by hoe-cutting and salting, or drainage and cultivation.

The Potato Family.—SOLANACEÆ.

Chiefly herbs with alternate leaves and colorless juice. Flowers regular, usually in cymes; calyx attached to the ovary, 5-lobed; petals united into a wheel-shaped, funnel-form, bell-shaped or tubular 5-lobed corolla, the lobes folded in the bud; stamens 5, inserted on the tube of the corolla and alternate with its lobes. Fruit usually a 2-celled, many-seeded capsule or a berry.

A large family in the tropics but very few native to North America. Among cultivated forms are the potato, tomato, red pepper, tobacco and egg-plant; all of these except the last natives of South or Central America and introduced from there to Europe. Potatoes from South America were introduced into England in 1586 and into Ireland in 1610, where they long furnished three-fifths or more of the entire food of the people, and so gained the name of Irish potato. Of the tobacco, Dr. Wm. Darlington, a noted botanist of Pennsylvania, wrote in 1847: "The extent to which this nauseous and powerfully narcotic plant is cultivated—its commercial importance—and the modes in which it is employed to gratify the senses—constitute, altogether, one of the most remarkable traits in the history of civilized man. Were we not so practically familiar with the business, we should, doubtless, be disposed to regard the whole story of the *tobacco trade,* and the uses made of the herb as an absurd and extravagant fable. In view of the facts and circumstances, it does seem like sheer affectation on our part, to pretend to be astonished at the indulgence of the Chinese in the use of opium. The habitual use of tobacco is always more or less injurious to the system—especially the nervous system—and in many instances it is highly deleterious. I speak from long observation, and a personal experience of many years, having smoked and chewed the herb, until its pernicious effects compelled me to *es-chew* it altogether." Although not a user of the weed, the writer heartily endorses every word of the above statement.

About 20 species of the potato family grow wild in Indiana, several of which have escaped from cultivation. Among them are the ground cherries, nightshades, horse nettles and jimson-weeds. These include several weeds of the first class.

90. Physalis pubescens L. Low Hairy Ground-Cherry. Strawberry Tomato. (A. N. 2.)

Stem spreading, angled, much branched, more or less velvety hairy; leaves thin, ovate, pointed, entire or sparingly toothed. Flowers solitary, axillary; calyx bell-shaped, 5-lobed, the lobes lanceolate, as long as the tube; corolla about ½ inch broad, bell-shaped, dull yellow with a purplish center. Fruiting calyx rather small, cone-shaped, sharply 5-angled, sunken

at base, closed at tip and loosely surrounding the green or yellow berry. Seeds numerous, kidney-shaped, flattened, with a thin edge, finely pitted. (Fig. 88.)

Very common in lowland sandy fields and waste places. June–Oct. This is the most abundant of the 8 species of ground cherries listed from the State. All can be recognized by the much inflated bladdery calyx which encloses the small tomato-like fruit. They are distinguished one from another by the smoothness or hairiness and shape of the leaves, by the color and size of the flowers and by the shape of the calyx in fruit. The one above described is the only common annual form. Among the perennial ones with underground rootstocks the clammy ground-cherry (*P. heterophylla* Nees.), having large heart-shaped leaves, 2 inches or more long, densely clothed with short more or less sticky hairs; the Virginia ground-cherry (*P. virginiana* Mill.), with ovate, sparsely hairy leaves and fruiting calyx cone-shaped, 5-angled and deeply sunken at the base, and the prairie ground-cherry (*P. lanceolata* Michx.), leaves narrow, lanceolate or spoon-shaped, fruiting calyx rounded, egg-shaped, scarcely angled and little sunken at the base, are the common forms. Remedies: thorough cultivation; mowing or cutting the perennial forms two or three times each season.

Fig. 88. Fruit enclosed in calyx. (After Britton and Brown.)

91. SOLANUM CAROLINENSE L. Horse Nettle. Bull Nettle. Sand Brier. Tread-soft. (P. N. 1.)

Erect, branched, 1–2 feet high, the branches, leaf-stalks and mid-ribs of the leaves armed with numerous short, stout, awl-shaped yellow prickles; leaves oblong or ovate, 2–6 inches long, cut-lobed or toothed, covered with numerous minute star-shaped hairs. Flowers in loose clusters; calyx lobes tapering; corolla wheel-shaped, purplish or white. Berry naked, orange-yellow, about ½ inch broad, closely resembling that of the potato. Seeds numerous, straw-color, flat, rounded or ovate, 1/10 inch long. (Figs. 10, *d*; 11, *e*, 89.)

A very common and pernicious weed growing in both cultivated ground and pasture land, especially in dry and sandy soils. May–Sept. It is a southern species which has spread widely both by strong rootstocks and numerous seeds. In many places in the southern two-thirds of Indiana it has, in recent years, become one

of the most troublesome of corn-field weeds. In pastures it is also very common and annoying, often growing in patches so thick as to monopolize the soil. Nothing but sheep among live stock will eat it, and they feed mostly upon the berries and so scatter widely the seeds. It is attacked by a leaf-beetle (*Leptinotarsa juncta* Germ.) very similar to the Colorado potato beetle. This beetle also preys upon some of the ground-cherries, but unfortunately it is not very common. The plant is so tenacious of life that it is almost impossible to eradicate where it once gets a good start, as it never relinquishes any ground once occupied. One farmer in Lawrence County stated that he had proven "that their roots will live 10 years under a heap of sawdust and grow as soon as the dust is removed." The first specimen on farms not already infested should be promptly destroyed. Remedies: repeated cutting with hoe or spud and salting; alternate cultivation and heavy cropping with clover.

Fig. 89. (After Vasey.)

92. SOLANUM ROSTRATUM Dunal. Texas Nettle. Prickly Potato. Buffalo-bur. Prickly Nightshade. (A. N. 1.)

Erect, branching, 1–2 feet high, very thickly armed with yellow, awl-shaped prickles and densely covered with 5–8-rayed hairs; leaves 2–5 inches long, more or less divided or cut-lobed. Flowers in loose clusters of 3–5, yellow, about 1 inch broad; calyx densely prickly, surrounding and wholly enclosing the berry, its prickles becoming as long as the fruit. Seeds kidney-form, black or greenish, 1/10 inch long, strongly pitted. (Fig. 90.)

Fig. 90. *a*, spray of mature plant with flowers and fruit; *b*, flower; *c*, seed. (After Dewey.)

A weed of the western plains which, through seed in hay and by railways, is gradually spreading eastward. Occurs in dry upland or sandy lowland soil. May–Sept. It was first taken by the writer in Vigo County in 1888, and in the State catalogue of plants is listed from six other widely scattered counties. It has been recorded as being one of the 34 worst weeds in the United States* and should be destroyed on sight. In some places it is called the "potato bug plant," as it was the original food of the Colorado potato beetle. When, about 1865, potato cultivation began in Colorado and Nebraska, the beetle found the new plant more to its liking and less spiny to crawl over, and practically forsook its old host, to the great detriment of potato growers throughout the land. The plant has been aptly described as appearing like a cross between a thistle and a potato. Being an annual it can be easily controlled by pulling or cutting before the berries ripen.

93. SOLANUM NIGRUM L. Black Nightshade. Deadly Nightshade. (A. N. 2.)

Erect, angular, much branched, glabrous or sparingly hairy, 1–2 feet high; leaves ovate, stalked, wavy-toothed, 2–4 inches long, bases oblique. Flowers white, drooping, in small umbel-like clusters. Berries globular, smooth, black, juicy, 1/3 inch in diameter. (Figs. 10, *d*; 91.)

Fig. 91. (After Chesnut.)

Common in gardens, old fields and shaded waste grounds, especially about dwellings and outbuildings. July–Oct. While probably a native it has been widely distributed in nearly all countries as a weed. It is a homely, ill-smelling poisonous plant which should be kept away from the vicinity of all dwellings as its grape-like berries are apt to be eaten by children with serious results, and calves, sheep and hogs are often poisoned by them. The principal symptoms of the poison are dilation of the pupil of the eye, stupefaction, staggering, loss of speech, feeling and consciousness. Like other annuals, the plant may be easily eradicated by pulling or cutting before the berries mature.

The climbing nightshade or bittersweet (*Solanum dulcamara* L.) is an introduced and closely allied species, whose stem is climbing or straggling, 2–10 feet long, with

*Halstead, Bot. Gaz., April, 1889.

ovate or hastate pointed leaves, blue wheel-shaped flowers and oval red berries. It is also said to be poisonous and should be kept down in the same manner. Another "bitter-sweet" (*Celastrus scandens* L.) is a handsome wild twining vine of the Wahoo Family, which is ornamental and not injurious.

94. DATURA STRAMONIUM L. Jimson-weed. Thorn Apple. Devil's Apple. (A. I. 1.)

Stem green, stout, widely branched, 1–5 feet high; leaves thin, ovate, scallop-toothed, pointed, 3–8 inches long. Flowers large, solitary, erect, short-stalked; corolla white, funnel-form, 3–4 inches long; calyx tubular, ⅓ the length of corolla. Capsule dry, egg-shaped, about 2 inches long, densely prickly, the lower prickles shorter. Seeds black, kidney-form, wrinkled and finely pitted, ⅛ inch long. (Fig. 92.)

A common, very ill-smelling, coarse and homely weed, occurring in rich soil about barnyards, sites of old strawstacks and dwellings, manure heaps, etc. June–Sept. Another species, the purple jimson or purple thorn-apple (*D. tatula* L.), stem purple, more slender and usually taller, corolla violet or purplish, its tube nearly white, and prickles of capsule all long, occurs with it or in similar places and is equally common and stinking. The first named came originally from Asia and the purple species from Central America. The name "jimson-weed" is a corruption of Jamestown weed and was given both because they first appeared in this country about Jamestown, Virginia. Both species are powerfully narcotic and poisonous and equally obnoxious and unsightly weeds which every farmer possessing the instinct of neatness should keep from his premises. Remedies: pulling or cutting before the seed matures; cultivation.

Fig. 92. *a*, flowering spray; *b*, fruiting capsule. (After Chesnut.)

Children are frequently poisoned by eating the leaves or seeds or sucking the flowers, and cattle are known to have been poisoned by eating the leaves of young plants in hay. The poison causes headache, nausea and great thirst, followed by dilated pupils, loss of sight and, in extreme cases, convulsions and death.

The dried leaves and seeds of both jimson-weeds are powerful

anodynes and are much used in medicine, especially for asthma and kindred troubles. They are mostly imported, though they can be easily gathered and prepared for sale by farm boys and girls. The leaves should be stripped from the plant when the latter is in flower, and carefully dried in the shade. In the collecting of the seed the capsules should be picked when they are quite ripe but yet green in color, and dried for a few days, when they will burst and allow the seeds to be shaken out. These should then be thoroughly dried. The leaves are sold under the name of stramonium at 2 to 8 cents a pound; while the seeds bring 3 to 7 cents a pound.

The Figwort Family.—SCROPHULARIACEÆ.

Chiefly herbs with perfect, complete and usually irregular flowers, having the calyx 4–5-toothed, -cleft or -divided; corolla with the petals united, usually 2-lipped; stamens 2–4, rarely 5, inserted on the corolla and alternate with its lobes; ovary 2-celled with many ovules. Fruit a 2-celled and usually many seeded capsule which splits lengthwise.

A family of 2,500 or more known species widely distributed but most abundant in temperate regions. The flowers, which are mostly 2-lipped, resemble those of the mints, but the plants are usually easily distinguished from the mints, by the cylindric stems and 2-celled, many seeded pods. Moreover the figworts are mostly bitterish whereas the mints are fragrant or aromatic. Among the more common of the 50 or more wild forms growing in the State are the mullens, toad-flaxes, turtle-heads, beard-tongues, monkey-flowers, speedwells, foxgloves, gerardias, painted-cups and louseworts. Only a half dozen or so are weeds and of these only the common mullen belongs to the first class.

95. Verbascum thapsus L. Common Mullen. Woolly Mullen. Velvet Plant. Aaron's Rod. (B. I. 1.)

Stem stout, erect, densely woolly, wing-angled by the bases of the leaves, 2–7 feet high; leaves alternate, oblong, thick, 4–12 inches long. Flowers yellow, sessile, in a long, dense cylindrical spike; corolla wheel-shaped; stamens 5, unequal, the 3 upper or shorter ones woolly. Capsules slightly longer than the calyx. Seeds rough, not winged. (Fig. 93.)

A very common and well known weed, occurring in dry or sandy soil along roadsides and embankments, and especially on the slopes of old abandoned fields and in poor half-barren pastures. June–Sept. The plant produces the first year a broad, thick and very handsome rosette of root leaves which, during the winter, lie

close to the ground. They, as well as the stem leaves, have much the feeling of flannel, being covered with fine branching hairs that interlace and form a felt-like surface. This rosette aids in conserving the water about the roots, the felt covering protecting the leaves from cold in winter and the fierce heat rays in summer, and also rendering them unpalatable to sheep and cattle. The leaves in the rosette vary in length so as not to wholly cut off the sunshine one from another and those of the stem are directed upward so as to cast little shade on those below. From the center of the rosette springs the stout flowering stalk of the second season.

Fig. 93. (After Henkel.)

The rosette furnishes shelter and protection to many an insect during the long winter months. On one January day the writer found snugly at home, between and beneath the leaves of a single mullen, 4 cutworms, 7 chinchbugs, 3 tarnished plant bugs and a number of others less injurious, enough to have produced 10,000 like themselves the next season. By keeping the farm and roadsides clear of mullen and similar plants, the number of injurious insects will be greatly lessened as they will lack suitable places to hibernate. In late summer, when the rosette and lower stem leaves are dead and the plant is nearly through its blooming, the mullen stalk is a very rough and homely looking object, only the few golden yellow flowers at top showing a bit of beauty. There is no surer evidence of a negligent farmer than to see his fields overrun with these ungainly stalks. Producing as it does a vast number of seeds which will retain their vitality for years, the plant can only be kept down by killing before its seeds ripen. This can best be done by deep cutting with hoe or spud in late autumn or early spring.

The leaves and petals of the mullen are used extensively in medicine for coughs, catarrh, nervousness and inflammation. The dried leaves are said to be often smoked like tobacco to relieve nasal catarrh and affections of the throat, and an infusion of the roots is a popular country remedy for malaria. In gathering the leaves and petals for sale both should be collected when the plant is in

blossom and carefully and thoroughly dried. The petals absorb moisture quickly and when dry must be kept in tightly corked bottles. Both are sold under the name of verbascum, the leaves bringing from 3 to 5 cents and the petals 25 to 75 cents a pound.

Although an immigrant from Europe, it is said to be much more common in its adopted country—"the land of the free"— not only for humans but for weeds. John Burroughs in his "October Abroad" says: "I have come three thousand miles to see the mullen cultivated in a garden and christened 'the velvet plant.'" In Europe it has more than 20 common names, one of which is "hag-taper," as its stalks were once used for candle wicks and funeral torches and were supposed to be borne about by witches while tending their cauldrons of stewing herbs.

96. VERBASCUM BLATTARIA L. Moth Mullen. (B. I. 2.)

Erect, slender, glabrous, simple, 2–4 feet high; upper leaves oblong or ovate, toothed, pointed, sessile or clasping, ½–2 inches long; lower and basal ones often short-stalked, sometimes 1 foot long. Flowers short-stemmed in a long slender raceme; corolla yellow or cream-colored with a brown or purplish eye; stamens with violet hairs. Seeds very small, 6-sided, brown, pitted.

Frequent in open pastures, timothy meadows and along roadsides in dry soil. June–Oct. Both it and the common mullen differ from other figworts in having wheel-shaped, not 2-lipped, corollas and 5 instead of 2 or 4 stamens. The moth mullen is said to repel cockroaches, whence the specific name *blattaria*, the first name of the more common roach being *Blatta*. The odor of its flowers is delicate and pleasing, sufficient to attract unto themselves many a moth and other insect. One which is usually to be found on it and its larger cousin, is a small, thick-bodied, grayish snout beetle,* whose young live in the pods and feed upon the mullen seeds. As a weed of timothy meadows the moth mullen takes high rank since its seeds are very common among those of timothy. Remedies: hoe cutting in early spring; cultivation; clean timothy seed.

97. LINARIA LINARIA L. Butter and Eggs. Toad-flax. Ranstead. (P. I. 2.)

Stems slender, erect, pale green, 1–3 feet high; leaves very numerous, mostly alternate, linear, sessile, entire. Flowers in a dense terminal raceme; corolla 2-lipped, spurred at the base, pale yellow, the throat orange-colored, the awl-shaped spur darker and almost as long as the remainder of the corolla; stamens 4, 2 long, 2 short. Seeds numerous, black, winged, 1/12 inch across. (Fig. 94.)

Gymnetron teter Fab.

Frequent in dense tufts or patches along banks, roadsides and railways where it has escaped from cultivation. June–Sept. In the country it is a well known plant which a half century ago was grown for ornament much more commonly than now. In many of the eastern States it has spread over upland meadows and pastures until it is accounted one of the worst of weeds, and it is very likely to do the same in Indiana. It has a disagreeable odor and spreads both by underground stems and seeds, taking almost exclusive possession of the soil. Although the flowers are somewhat showy it is a weed which should be destroyed before it is too late to prevent extensive spreading. Remedies: continuous cultivation and heavy cropping; cutting several times each season and then salting or using coal-oil or sulphuric acid on the rootstocks.

Fig. 94. Showing flower and seed. (After Vasey.)

98. SCROPHULARIA MARYLANDICA L. Pilewort. Figwort. (P. N. 3.)

Stem slender, 4-angled, erect, widely branched, 3–10 feet high; leaves ovate, long-stalked, pointed, sharply toothed, 3–12 inches long. Flowers small, numerous, in loose, compound cymes; corolla irregular or somewhat 2-lipped, dull green without, brownish-purple within, the upper lip erect, the lower spreading; perfect stamens 4, the fifth represented by a deep purple scale on the roof of the corolla tube. Capsule egg-shaped, many-seeded. Seeds dull brown, 1/32 inch long, grooved and roughened. (Fig. 95.)

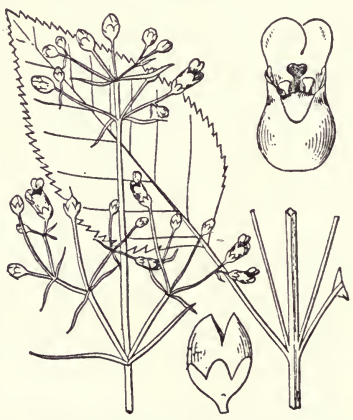


Fig. 95. Single flower above; fruit below. (After Britton and Brown.)

Frequent along fence-rows, borders of thickets and damp woods in rich moist soil. June–Oct. It varies greatly in height and date of blooming. The name *Scrophularia* was given this or a closely allied plant because it is used as a remedy for scrofula and other skin diseases, also as an anodyne to allay

restlessness, insomnia, etc. The roots are the part used, and if gathered for sale should be thoroughly cleaned and dried. Remedies: pulling or grubbing; cutting several times each season.

99. VERONICA PEREGRINA L. Purslane Speedwell. Neckweed. (A. N. 2.)

Stem erect or ascending, glabrous, simple or branched, 3–9 inches high; lower leaves opposite, oval or oblong, short-stalked; upper ones alternate, oblong or linear, sessile, each with a short-stalked flower in its axil. Flowers very small, nearly white; corolla wheel-shaped, shorter than calyx. Capsule nearly circular, notched above, many seeded. Seeds flat, very small.

Common in moist waste and cultivated grounds, along roadsides, in lawns, etc. April–Oct. The name neckweed was given it from its formerly being used in scrofulous affections of the neck. This is the most common of a small group of weedy plants, known as speedwells or veronicas. All have only two stamens inserted at the base of the upper lobe of the 4-parted, wheel-shaped corolla. Most of them are less than a foot high, and the leaves are in part or all opposite, the flowers pale blue or white and the capsule or pod flat, usually heart-shaped or notched above. They are named for St. Veronica who, according to an old tradition, was a Jewish maiden who wiped with her handkerchief the drops of anguish from the face of the Savior when the latter was on the way to the cross. The sacred features remained impressed upon the linen and from the fancied resemblance of the blossoms of the speedwells to this hallowed relic, the name *Veronica* was given them. In Germany the speedwell is known as the flower of truth and the emblem of friendship. Its name, like the forget-me-not, is a good wish at parting.

Fig. 96. Common speedwell; *a*, flower; *b*, fruit. (After Watson.)

In addition to the one described three others which are common throughout the State are (*a*) the corn speedwell (*V. arvensis* L.), annual, stem spreading, leaves pubescent, toothed, flowers solitary in the axils, capsule heart-shaped, deeply notched; (*b*) the common speedwell (*V. officinalis* L., Fig. 96), perennial, prostrate, flowers in terminal spike-like racemes, leaves oval, stalked, hairy, capsule triangular, broadly and shallowly notched, and (*c*) the thyme-leaved speedwell (*V. serpyl-*

lifolia L.), perennial, flowers in terminal spikes, leaves all opposite, glabrous, capsule broader than long, obtusely notched. All begin flowering in March or April and continue until frost. They are weeds in that they grow where grass or other crops should be found. Remedies: thorough cultivation; crowding out with clover; pulling or cutting from lawns and yards.

The Trumpet-creeper Family.—BIGNONIACEÆ.

Woody vines or trees with opposite compound or simple leaves and large showy clustered or axillary flowers. Corolla funnelform, bell-shaped or tubular, 5-lobed and somewhat 2-lipped; stamens 2 or 4, inserted on the tube of the corolla and alternate with its lobes; ovary 2-celled, many ovuled. Fruit a 2-valved capsule, opening lengthwise. Seeds flat, transverse, winged.

Chiefly a tropical family represented in the eastern United States and Indiana by only 4 species, viz., the cross-vine, a handsome woody vine of southern range, found in Indiana only in the lower Wabash valley; two species of catalpa trees and the trumpet-creeper. The latter is often very troublesome and is therefore included in this list of weeds.

100. Tecoma radicans L. Trumpet-creeper. Trumpet-flower. (P. N. 2.)

A woody vine, climbing to a height of 20 to 40 feet by means of air rootlets; leaves pinnate or 7–11-divided; leaflets ovate, short-stalked, sharply toothed. Flowers in clusters of 2–9; calyx 5-toothed, leathery; corolla orange and scarlet, 2–3 inches long. Capsules robust, 4–6 inches long, narrowed at both ends. Seeds broadly winged on the edges, the wings frayed. (Fig. 97.)

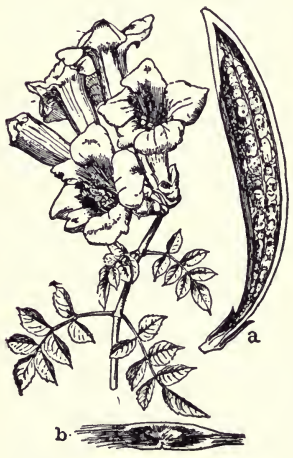


Fig. 97. Spray of flowers; *a*, pod; *b*, winged seed. (After Watson.)

Frequent along fence-rows, borders of thickets, etc., especially in sandy alluvial soils. June–Aug. Common in cultivation in the northern part of the State but southward, where it is native, the numerous sprouts give much trouble in meadows and cultivated fields, where they spring up by hundreds in strips along the fences or wherever the old plant can get some sort of support, being especially annoying in the river bottom fields of the larger streams. Remedies: repeated grubbing; abandonment of fences and thorough cultivation of the infested areas.

Where kept within bounds the trumpet-creeper is queen of all our twining or trailing shrubs. When in the prime of the blooming period its large pinnate leaves out-rival the emerald in their shade of green. Then, as one drives along some country lane or roadway, high in air it can be seen, clambering over fence stake and bushy shrub, its great orange and scarlet flowers conspicuous for rods away and attracting unto themselves many a hummingbird and bumble-bee. 'Tis in the angles of old rail fences that it finds a home most congenial to its taste. There rail and bush and shrub furnish a ready support to which its aerial rootlets freely cling, and there it forms many a snug retreat in which the nest of woodland songster is securely hidden.

The Plantain Family.—PLANTAGINACEÆ.

Chiefly stemless herbs with basal leaves in clumps, and small, inconspicuous flowers in dense terminal spikes or heads on leafless flower-stalks. Calyx 4-parted, persistent; corolla 4-lobed, thin, dry, membranous, withering but remaining on the spike; stamens 4, rarely 2, inserted on the tube of the corolla; ovary 2-celled. Fruit a 2-celled several seeded capsule, which opens by the top falling away as a lid. (Figs. 13, *a*; 14, *c*.)

A family of about 200 species, represented in Indiana by 8 species of plantain or ribwort belonging to the genus *Plantago*. All have the leaves strongly ribbed and the small whitish flowers borne in a bracted spike or head on a leafless stalk which springs from the center of the basal tuft of leaves. Among the 8 two are weeds of the first class, while a third promises as bad. The stems of all are invisible, being short and underground, and as the flowers of all depend upon the wind to carry the pollen, the corolla is therefore almost useless and has lost whatever color it may have once possessed. The seeds of all plantains are more annoying than the weeds themselves, causing much extra expense in cleaning the seeds of grasses and clover, with which they are very common.

To bring about that cross-fertilization so necessary to the success of plant life, the plantains have during the ages past evolved an ingenious method. Each plantain flower has both stamens and pistils but the pistils mature first and are fertilized by pollen blown to them from some neighboring plant. After the pistils have matured the stamens ripen, the anthers hanging out on their long slender filaments or stalks so as to have their pollen discharged by every passing breeze. On each spike the lower flowers open

first and on one-half through blooming the stamens of the lower part are shedding their pollen while the pistils of the upper portion are being fertilized. Thus the pollen cannot fall from the stamens to another flower on the same stalk and self-fertilization is avoided.

101. PLANTAGO MAJOR L. Common Dooryard Plantain. Greater Plantain. (P. I. 1.)

Fig. 98. *a*, flower; *b*, fruit, a pyxis (After Watson.)

Leaves spreading or half erect, long-stalked, broadly ovate, smooth or slightly hairy, dull pointed, 3–11 ribbed, rounded at base, 1–10 inches long. Spikes several, dense, blunt at top, 2–10 inches long. Capsule egg-shaped, the top separating at about the middle, 8–16 seeded. Seeds angled, very irregular in shape, greenish-brown to black, 1/16 inch long, about ½ as wide. (Fig. 98.)

Very common in dooryards, along walks and roadsides and in enriched cultivated fields. May–Oct. This plantain delights in a compact clayey soil, and with the knot-grass combats most fiercely for supremacy along the sides of narrow footpaths in unkempt country dooryards and the cow-paths of old pastures. It is one of the most common and best known of the social weeds and by the Indians was known as the "white man's foot." Longfellow refers to it by this name when in speaking of the English settlers in his poem Hiawatha, he says:

> "Wheresoe'er they tread, beneath them
> Springs a flower unknown among us,
> Springs the white man's foot in blossom."

Hardy, tough and difficult to eradicate, its thick rootstocks and many seeds give it more than an average chance in the struggle for life. It is especially troublesome in manured land sown to clover, as its seeds are very common among those of clover. Remedies: continuous cultivation; crowding out with clover or rye; reseeding bare spots in meadows and pastures; hand pulling or cutting below the crown with sharp knife, hoe or spud in yards.

The leaves of the dooryard plantain were formerly much used as a convenient and popular dressing for wounds, blisters and other sores. Two of the old English names for it are "wound-weed" and

"healing blade," and it was probably the first "shin-plaster" used by man. This property was known to Shakespeare, as in Romeo and Juliet, Act I, sc. 2, we find:

> *"Rom.*—Your plantain leaf is excellent for that.
> *Ben.*—For what, I pray thee?
> *Rom.*—For your broken shin."

On account of its so persistently haunting the pathways of man the Germans have a story that the plantain was formerly a maiden who watched so patiently by the roadside for her absent lover that the fairies took pity on her and changed her into this wayside plant.

Mingled with the common plantain in dooryards, especially in northern Indiana, is the pale plantain (*P. rugelii* Dec.) distinguished by its brighter green and thinner leaves, less dense and more pointed spikes and the separation of the lid of the capsule much below the middle. The seeds are also much larger and fewer, there being only 4–9 in each pod.

102. PLANTAGO LANCEOLATA L. Buckhorn. Narrow Plantain. Ribwort. Rib-grass. English Plantain. (P. or B. I. 1.)

Rootstock short, erect, the leaves with tufts of brown hairs at their bases; leaves oblong-lanceolate, erect or spreading, pointed, narrowed at base, 3–5 ribbed, 2–12 inches long. Flower-stalks several, slender, grooved, sometimes 2 feet or more tall; spikes very dense, cylindric, blunt, 1–4 inches long. Capsule oblong, blunt, 2-seeded, the top separating at about the middle. Seeds oval, deeply grooved lengthwise or boat-shaped on the inner side, chesnut brown, 1/10 inch long, smooth and shining. (Fig. 99.)

Fig. 99. (After Clark.)

Very common along railways, in waste places and especially in meadows. April–Oct. In the last five years this rib-grass or buckhorn, as it is commonly called, has come to be one of the worst pests known in the clover and timothy fields of the State, especially those with light sandy or gravelly soil, or on clayey uplands. Its seeds are widely distributed with those of clover, alfalfa and other hays and in manure, and its thick rootstocks give it an advantage over many weeds. It is especially annoying to dealers in clover seed as it is very difficult to thoroughly separate its seed. Remedies:

sowing clean seed; plowing under badly infested fields and cultivating in some other crop until every plantain top has been destroyed; where but a few plants are present, deep cutting with hoe or spud; increased fertilization and crowding out with heavy crops of clover; in lawns and pastures, digging and reseeding, or persistent mowing. In those favored localities where it is not yet known farmers should be on the especial lookout for it and quickly destroy every plant which comes to their notice.

In England, where it is very common, this plantain has a score or more of common names among which are ripple-grass and kempseed. The name "kemps" comes from the old Danish *kæmpe,* a warrior, and is applied to the heads of the plantain by children who play with the flower-stalks and try to knock off the heads of each other's mimic weapons. The heads when they appear in spring are blackish and the children, when they first see them, repeat the following rhyme:

"Chimney sweeper all in black,
Go to the brook and wash your back,
Wash it clean or wash it none;
Chimney sweeper, have you done?"

103. PLANTAGO ARISTATA Michx. Bracted Plantain. (A. N. 2.)

Fig. 100. *a*, mature plant with grass-like leaves and bracted spikes; *b*, top of fruit with corolla attached, the 2 seeds hanging in it; *d*, seed. (After Dewey.)

Leaves linear, erect, pointed, dark green, 3-ribbed, narrowed at base. Flower-stalks erect, longer than the leaves, 6–18 inches tall; spikes very dense, hairy, cylindric, 1–6 inches long, the flowering bracts 3–10 times the length of calyx. Capsule 2-seeded. Seeds dark brown, 1/10 inch long, one side rounded and with a distinct groove across its middle, the other side flat and lengthwise grooved. (Fig. 100.)

A western plant introduced in baled hay and seeds and becoming common along roadsides, railways and in meadows. May–Oct. First noted by the writer in Vigo County in June, 1888. It is most commonly a winter annual and is becoming more abundant in meadows each year. By farmers it is often called "bristly buckhorn" to distinguish it from the more common species.

Its seeds are readily told by the cross-groove on the rounded side. Remedies: hand digging in late fall or early spring; cutting before the seeds ripen; thorough cultivation.

The dwarf white plantain (*P. virginica* L.), leaves ovate or spoon-shaped, white hairy, stamens 4, corolla lobes erect and closed over the tops of the capsules, occurs frequently in dry or sandy soil, but does not promise to spread enough to do much harm.

The Teasel Family.—DIPSACACEÆ.

Herbs with opposite leaves, mostly prickly stems, and perfect flowers in dense oblong heads surrounded by an involucre. Calyx cup-shaped, the tube attached to the ovary; corolla oblique or 2-lipped, 4-lobed; stamens 4, inserted on the tube of the corolla and alternate with its lobes; ovary 1-celled. Fruit an achene, its tip crowned with the persistent calyx-lobes.

In the Old World this family is represented by 140 species, four of which have been introduced and now grow wild in the eastern United States. Of these only one occurs in Indiana. The sweet scabious is a cultivated member.

104. Dipsacus sylvestris Huds. Wild or Common Teasel. English Thistle. (B. I. 2.)

Stem stout, 3–6 feet high; with numerous short prickles on the branches, midribs of the leaves and involucre; leaves sessile, lanceolate or oblong, the upper pointed, entire, often united at base, the lower blunt-toothed or somewhat divided, often 1 foot long. Flowers purplish, ½ inch long, in dense cylindric heads 3–4 inches long, each flower with a bract or scale beneath it which ends in an awl-shaped barbed awn longer than the flower itself; leaves of the involucre linear, curved upward, as long as the head. (Fig. 101.)

Fig. 101. (After Millspaugh.)

Common in dry soil in southern Indiana along roadsides, waste places and barren slopes of old abandoned fields. July–Sept. The flowers begin to blossom in a ring about the middle of the head and gradually open towards both base and apex. The large heads, spiny involucre and prickly leaves make the teasel a striking and rather handsome roadside plant when in blossom but an unsightly weed when dead. Remedies: mowing as often as the heads are

formed; deep cutting in early summer; in old fields, increased fertilization and cultivation.

The fuller's teasel (*D. fullonum* L.) is generally regarded as a cultivated form of the wild plant. It has the points of the chaffy bracts hooked at the tip and the heads were formerly used by cloth manufacturers as a kind of card to raise the nap on woolen cloth.

In Europe it is used to foretell the weather, it being said that "tezils, or fuller's thistle being gathered and hanged up in the house, where the air may come freely to it, upon the alteration of cold and windy weather will grow smoother, and against rain will close up its prickles."

The Bell-flower Family.—CAMPANULACEÆ.

Herbs with alternate leaves, acrid and usually milky juice and perfect scattered flowers. Calyx 5-lobed or parted, its tube attached to the ovary; corolla 5-lobed or more or less 2-lipped, the petals rarely wholly separate; stamens 5, free from the corolla, alternate with its lobes; ovary 2–5 celled. Fruit a capsule with very small and numerous seeds.

By recent botanists the bell-flowers and lobelias have been combined into one family of 1,500 or more species of wide geographic distribution. It is represented in Indiana by 6 bell-flowers and 7 lobelias, 3 of which are common enough to be termed weeds, though none of them are very aggressive. To the family belong some of our most handsome wild flowers. The tall bell-flower, with its blue bell-like blossoms in a long loose terminal spike, is frequent along the borders of moist woods and thickets throughout the State, while the little harebell and the marsh bell-flowers occur only in the northern counties. One of the lobelias is

> "The cardinal-flower whose heart-red bloom
> Glows like a living coal upon the green
> Of the midsummer meadows."

It waves its red pennons above the sedges of many a swamp and among all our wild plants which bloom from August to October it is without a peer for brilliancy of color and gracefulness of form. The flowers of the lobelias resemble those of the mints and figworts, but the stamens or anthers are always more or less united and the corolla is split to the base on one side.

105. Legouzia perfoliata L. Venus' Looking Glass. Clasping Bell-flower. (A. N. 3.)

Stem very leafy, half erect or prostrate, often branched near the base, 6–24 inches long; leaves shell-shaped, scalloped, rounded or broadly

ovate, clasping the stem. Flowers solitary or 2–3 together in the axils of the upper leaves; corolla wheel-shaped, blue or violet, ½ inch or more broad; stamens 5, separate. Capsule oblong, opening just below the middle. (Fig. 102.)

Fig. 102. Showing 2 forms of flowers and single fruit. (After Britton and Brown.)

Common in dry or sandy rather poor soil in southern Indiana; infrequent northward. May–Sept. It occurs mostly in grain fields, thinly seeded meadows and waste places, the flowers closing by noon or mid-afternoon. Those on the lower part of the stem are usually rudimentary, without corolla. The name was first given to a European species because of some fancied resemblance to an old-fashioned round mirror. Remedies: increased fertilization; pulling or cutting before the seeds ripen.

106. LOBELIA SYPHILITICA L. Great Lobelia. (P. N. 3.)

Erect, simple, rather stout, somewhat hairy, 1–3 feet high; leaves thin, numerous, oblong or oval, pointed, 2–6 inches long. Flowers in a dense, leafy bracted, loose spike, showy, bright blue, rarely white, 1 inch long; corolla 2-lipped, split to the base on one side, the upper lip with 2 erect lobes, the lower spreading and 3-cleft; anthers united into a tube or ring. Capsule 2-valved, opening at the top.

Common in low moist grounds along ditches and borders of marshes, streams and thickets. July–Sept. Except in color its flowers are similar to but stouter than those of the cardinal-flower. A striking and handsome member of our late summer flora, and occupying for the most part only waste ground, it is doubtful if it should be classed as a weed. It spreads both by seeds and offshoots from the base of the stem and may be controlled by mowing several times for one season or by grubbing.

107. LOBELIA INFLATA L. Indian Tobacco. Asthma Weed. (A. N. 3.)

Stem erect, leafy, usually much branched, 1–2 feet high; leaves thin, ovate or oblong, blunt-toothed, short-stalked or sessile. Flowers small, pale blue, ¼ inch long, in loose, bracted, spike-like racemes. Capsule inflated, ⅓ inch long, many seeded, cross-veined between the ribs. (Fig. 103.)

Common in dry open woods, meadows, pastures and borders of fields. July–Oct. It contains an acrid milky juice, and the whole plant is poisonous when eaten, but its leaves, flowering tops and seeds are much used in medicine as an expectorant, sedative and

emetic. Horses and cattle seem to know of its acrid qualities, carefully browsing the palatable herbage all about it, yet leaving its stalk untouched. Remedies: hand pulling or mowing before the seeds ripen; increased fertilization in old fields.

Fig. 103. (After Vasey.)

In gathering Indian tobacco for sale the leaves and tops should be collected in late summer, dried in the shade and then kept in covered vessels. The seeds are very small, 400 to 500 in each capsule. The dried leaves and tops bring from 3 to 8 cents and the seeds 15 to 20 cents per pound. They are sold under the name of lobelia.

The Chicory Family.—CICHORIACEÆ.

Herbs usually with acrid or bitter milky juice, alternate or basal leaves, and yellow, rarely pink or blue flowers in dense compound heads on a common receptacle and surrounded at base with one or more rows of scale-like bracts called the involucre. Flowers all alike, perfect; calyx tube surrounding and firmly joined to the ovary and usually having on its top a *pappus* of scales or bristles to aid in the distribution of the seed; corolla with its petals united into a long or short tube and a strap-shaped, usually 5-toothed, upper portion called a *ray*; anthers united into a tube; ovary 1-celled, 1-seeded. Fruit an achene. (Figs. 1, *a*; 10, *g*.)

Until recently this family and the next were united with the great family of Compositæ, comprising over 11,000 species of known plants. By modern botanists the Compositæ family has been split up into three, of which the dandelions, ragweeds and sunflowers are respectively among the best known and typical members of each. The group, with all the flowers of the head rayed or ligulate and the juice of stem and leaves milky, is separated from other Compositæ, having all the central flowers of the head tubular and the juice very rarely milky, under the name of the Chicory family. This separation is more for convenience in classification than for natural reasons. The strap-shaped corolla (Fig. 10, *g*) may be supposed to be formed by splitting a tubular one down one side

nearly to the ovary, the five teeth at the end of the ray in the dandelion flower representing the five united petals of the original tube. Similar but usually much broader ray-flowers are found in a circle around the head of tubular ones in many of the true Compositæ. To the Chicory family belong about 30 species growing wild in Indiana, among them being the dandelions, sow-thistles, wild lettuce and hawkweeds.

108. CICHORIUM INTYBUS L. Chicory. Wild Succory. (P. I. 2.)

Stem stiff, much branched, 1–5 feet high, from a long deep tap-root; basal leaves spreading, spoon-shaped in outline, 3–6 inches long, narrowed at base, sharply cut-lobed, the segments turned backwards; upper ones much smaller, oblong or lanceolate, partly clasping. Flowering heads numerous, 1 inch or more broad, 1–4 together in sessile axillary and terminal clusters; flowers several, bright blue, rarely white; pappus composed of 2 or 3 rows of short blunt scales at the top of the black, 4-sided achenes. (Fig. 104.)

Fig. 104. Spray of flowers, lower leaf and root. (After Clark.)

Frequent along roadsides and in pastures, waste places and gardens in northern Indiana; scarce in the southern portion. July–Sept. Occurs usually in patches in dry soil, its blue flowers adding a tinge of brilliant color along the roadways, though usually closing by noon. The endive or garden succory, a closely related species, is in England said to open its petals at 8 o'clock in the morning and close them at 4 in the afternoon, whence the lines:

"On upward slopes the shepherds mark
The hour when, to the dial true,
Cichorium to the towering lark,
Lifts her soft eye, serenely blue."

Although a vile weed where growing wild, chicory under cultivation is a plant of many uses. The Romans used it as a salad and pot-herb and it is related that "the leaves of chicory are boiled in potage or broths for sicke and feeble persons that have hot, weak and feeble stomachs, to strengthen the same." In Europe at the present time its young leaves when well blanched are much used for salad; the tender roots when boiled and served with butter and pepper are considered quite a delicacy, while the young leaves when boiled as spinach, using two waters, rival those of spinach

or dandelion for greens. The tops and roots are grown there extensively for stock-food.

The principal use of the root, however, is as a substitute for or an adulterant of coffee and persons accustomed to its use maintain that a mixture of 2 or 3 parts of good coffee to one of ground roasted chicory is superior to and more economical than coffee alone. More than 15 million pounds of chicory root are annually imported into the United States from Belgium and other European countries for the sole purpose of adulterating ground coffees. Where escaped as a weed the chicory can be controlled by deep cutting or grubbing with hoe or spud and prevention of seeding in gardens.

109. TARAXACUM TARAXACUM L. Dandelion. Blowball. (P. I. 1.)

A stemless herb producing a cluster or rosette of spreading basal leaves from the midst of which the leafless flower-stalk springs; leaves oblong or spoón-shaped in outline, deeply and irregularly lobed or cut-toothed, hairy when young, 3–10 inches long. Heads golden yellow, 1–2 inches broad, containing 150–200 flowers. Achenes or seeds greenish-brown, spindle-shaped, narrowed above into a slender beak which in age supports a globular mass of white hair-like pappus. (Figs. 1, *a*; 6, *h*; 105.)

Fig. 105. *1*, two flower stalks, one showing the head closed, with double involucre, the inner erect, the outer deflexed, the other the head open; *2*, single flower, showing seed, pappus, strap-shaped corolla, and stamens united around the 2-parted style; *3*, achene; *4*, pitted receptacle with single fruit. (After Strasburger.)

Very abundant everywhere in grass-lands, as lawns, pastures, meadows and along roadsides. In flower practically every day in the year that the weather is above the freezing point, and when not in flower getting ready to blossom. In cities it is by far the worst weed which persons desiring neat lawns have to contend with. True, the star-like golden flowers at times shine forth from the green of blue-grass lawn with beautiful effect, but the aftermath in the shape of unsightly flower stalks is not so pleasing. The time from flowering until the dispersal of the seeds is 8 to 10 days. As the myriad seeds are wafted everywhere by means of the pappus it is almost a hopeless task to keep the weed in subjection. Remedies: reseeding or resodding; digging with spud or an especial tool made for the purpose; in fields and gardens, thorough cultivation.

Aside from its being a nuisance in lawns, the dandelion is not a bad weed, as its leaves are eaten by most stock and form the basis of many a mess of greens for the dinner of the human. In Europe the young leaves are often eaten in early spring as a salad and near the larger cities of the Eastern States the plant is at present extensively cultivated for greens. One of the best known of the social weeds, it has followed man the world over, its short underground stem and leaves being able to withstand his constant tread. Ever a favorite of children, it is the

> "Dear common flower that blooms beside the way,
> Fringing the dusty road with harmless gold."

Many an hour of childhood has been happily spent in making curls and necklaces from its hollow stems. The common name is from the French *dent-de-lion,* meaning "lion's tooth" and is said to have been given it because the edge of the leaf looks like a row of teeth on the jaw of a lion. In England it is often called the "peasant's clock" because its flower opens very early in the morning and only in fair weather, while to dream of it is deemed a misfortune as it is said to bring bad luck.

The root of the dandelion is thick, tapering, bitter, sometimes 20 inches long. It is used in medicine under the name taraxacum as a tonic in diseases of the liver and in dyspepsia. For sale it should be dug from July to September at which time the milky juice is thicker and the root more bitter. After careful washing and thorough drying it should be sold as soon as possible, as its medicinal virtues decrease with age. More than 100,000 pounds are imported each year, the price ranging from 4 to 6 cents per pound. As common as the plant is in this country many a boy or girl ought to make good wages by collecting it for sale.

110. Sonchus asper L. Spiny Sow-Thistle. (A. I. 2.)

Stem leafy, succulent, seldom branched, 1–7 feet high; leaves alternate, spiny-edged, sometimes lobed or divided; lower and basal ones spoon-shaped, upper oblong or lanceolate, clasping by a rounded base. Heads numerous, many-flowered, 1 inch broad or less; bracts in several overlapping rows, glabrous; receptacle flat, naked; flowers pale yellow. Achenes flat, truncate above, ribbed lengthwise, topped with a copius pappus of soft fine white bristles. (Fig. 106.)

Common in waste places about cities and towns, along roadsides, railways and the borders of old fields. May–Nov. The leaves are very prickly along the margins, the ears at the base of the upper ones being rounded and the seeds or achenes not ribbed crosswise. In these respects it differs from another annual species, the com-

mon sow-thistle (*S. oleraceus* L.), in which the lower leaves are often divided, the margins toothed but not prickly, the ears at base pointed and the seeds with both cross and lengthwise ribs. Both species are eaten by sheep and infested pastures can be cleared of them in that way. The young leaves of the unprickly one are often used as greens or eaten as salad. In corn-fields which lie fallow for a year and in the unseeded shock rows of corn stubble wheat-fields they are often abundant. Remedies: cutting or pulling before the seeds ripen; burning mature plants.

Fig. 106. (After Millspaugh.)

In England the common sow-thistle is known as "hare's lettuce" or "hare's palace" from the shelter it is supposed to afford that animal as, "if the hare come under it he is sure that no beast can touch hym." Another superstitution is: "When hares are overcome with heat they eat of an herb called hare's lettuce, and there is no disease in this beast the cure whereof she does not seek for in this herb."

The perennial sow-thistle (*S. arvensis* L.) has not yet been recorded from Indiana, but is one of the worst weeds of Ontario and some of the eastern States, and occurs in northern Ohio. It has the bracts of the involucre glandular-hairy, the heads of flowers larger and brighter yellow and spreads by deep running rootstocks as well as by seeds. Remedies: deep cutting or digging; crowding out with clover; sheep-grazing.

111. LACTUCA SCARIOLA L. Prickly Lettuce. Milk Thistle. (A. I. 1.)

Stem stiff, leafy, glabrous, usually much branched, 2–6 feet high; leaves oblong or lanceolate, toothed or deeply cut-lobed, sessile or clasping, their margins and midribs strongly prickly, the lowest sometimes 10 inches long and 3 inches wide, upper much smaller. Heads ½ inch broad, very numerous in a broad open panicle; flowers 6–12, yellow; involucre cylindric, its outer bracts ⅓ the length of inner. Achenes flattened, brown, oblong, widening upward then suddenly contracting into a narrow neck, ribbed lengthwise, ⅛ inch long; pappus of fine soft white hairs.

Abundant in waste places along railways, streets, alleys and roadsides; also in old fields and gardens. June–Sept. From the sow-thistles this and other forms of wild lettuce are separated by having the upper end of the achenes or seeds tapering or beaked, whereas in the sow-thistles they are truncate or squared off. The prickly lettuce, like the majority of our vile weeds, came to us

from Europe, reaching Massachusetts about 1863 and Indiana in 1884, since which time it has spread over the entire State. Each plant produces from 8,000 to 10,000 seeds, which by aid of the abundant pappus are wafted far and wide by every passing breeze, and are ready to sprout and grow wherever and whenever the proper conditions of soil, moisture and temperature are present. The numerous prickles and bitter milky juice prevent all animals but sheep from feeding upon it. They eat it, especially the young leaves, greedily and in pastures it can be kept down by them alone. Its most aggressive character is its ability to grow anywhere and everywhere that its seed can secure a covering of earth and so from crevices in gutters into which a little soil has drifted, "from stone heaps, weed-choked corners of fences and yards, roadways and beaten paths it flourishes. But such poverty and ill usage are by no means essential factors to its success, for it also springs up in gardens, meadows and cultivated fields. Still the power to extract sufficient moisture and food from compacted and sunbeaten earth, and thus to overtop competitors, and in the less favorable spots to grow where few plants could live, place it in the front rank of noxious annual weeds."* Remedies: repeated mowing before the seeds ripen; burning mature plants; thorough cultivation.

Fig. 107. Showing the fruit with bristly parachute-like pappus at end of a long beak; a head of ripe fruits and a head of flowers. (After Atkinson.)

A closely allied species, the "strong scented lettuce" (*L. virosa* L., Fig. 107), is very common in clover fields. It differs in having the leaves all entire and lanceolate, the prickles on midribs and edges shorter, and also in being a winter annual, springing from the seed in autumn and reaching maturity in May or June of the next season. Both plants when cut or broken stool freely, sending up numerous spreading branches from the lower part, so that they must be cut with a hoe or pulled to prevent the ripening of the seeds. Both are "compass plants," having the leaves twisted on the stem so that their edges point up and down or vertical instead of horizontal, and the ends for the most part point north and south. The larger area of the leaves is therefore toward the east and west,

*J. C. Arthur, Bull. 52, Purd. Univ. Agr. Exp. Sta., 103.

and they are protected from the fierce rays of the sun which cannot beat directly down upon them.

112. LACTUCA CANADENSIS L. Wild Lettuce. Tall Lettuce. (A. or B. N. 3.)

Stem very leafy up to the flowers, branching above, glabrous, 3–12 feet high; leaves without prickles, the lower 6–12 inches long, sinuate toothed or lobed, pale beneath; upper lanceolate, entire, sometimes clasping. Heads numerous, ¼ inch broad, flowers about 20, pale yellow. Achene oval, very flat, about as long as the hair-like beak; pappus white. (Fig. 108.)

Common, especially in moist soil, along borders of woods, thickets, fence-rows, roadsides and cultivated fields. July–Oct. While not an aggressive weed it is an unsightly one and should be cleaned out of fence-rows and roadsides. Associated with it are several other species of wild lettuce, most common of which are the arrow-leaved lettuce (*L. sagittifolia* Ell.) having the leaves all entire, the flowers purplish-yellow, and the achene longer than its beak; and the tall blue lettuce (*L. spicata* Lam.) with deeply lobed leaves, blue flowers and brown pappus. The latter occurs frequently in moist soil along the borders of upland thickets and fence-rows and is among the tallest of our annual herbs, one specimen taken in Vigo County measuring 14 feet, 4 inches in height. Remedies: mowing before the seeds ripen; abandoning fences and cultivating the land thus redeemed.

Fig. 108. (After Millspaugh.)

113. HIERACIUM SCABRUM Michx. Rough Hawkweed. (P. N. 3.)

Stem stout, leafy, densely rough-hairy below and glandular-hairy above, 1–4 feet high; leaves oval or spoon-shaped, 2–4 inches long, sessile or the lower short-stalked, finely toothed. Heads 2/3 inch broad, 30–50-flowered, numerous in a rather broad panicle; bracts of involucre in one row, linear, glandular. Achenes blackish, cylindrical, truncate; pappus a single row of rather stiff brown bristles.

Common in dry soil in open woods, thickets and recent clearings. July–Sept. This and a half dozen other hawkweeds are found in the State, occurring for the most part on the slopes and ridges of high dry woodland pastures where the grass is thin. There in late summer their ray flowers strive to outdazzle the sunlight with their limpid yellow. Seldom noted except by the botanist they add their

mite of beauty to the woodland at a time when other flowers are scarce. In no place are they numerous enough to be very troublesome and in general they can be kept down by close grazing with sheep, or by mowing and salting.

Fig. 109. Golden hawkweed. (After Clark.)

Full 300 species of these hawkweeds are known in various parts of the world, 15 of which occur in the eastern United States. Of these but one, a European species, the golden hawkweed or devil's paint brush (*H. aurantiacum* L., Fig. 109), is an aggressive form but it has not been recorded from the State. In New England it is a serious pest in pastures and meadows and is spreading westward, having reached northeastern Ohio some years ago. From the rough hawkweed it may be known by having the leaves all basal and the heads nearly 1 inch broad, with the flowers reddish-orange in hue. It spreads by runners as well as by seeds and should be exterminated wherever a single stalk appears. This can be done by grubbing or heavy salting.

The Ragweed Family.—AMBROSIACEÆ.

Annual or perennial herbs with alternate, rarely opposite, leaves and small heads of greenish or white flowers surrounded at base by an involucre of few bracts. In our weeds the male and female flowers are in separate heads, the staminate (male) ones above. Female or pistillate flowers without corolla, or this reduced to a short tube or ring; calyx attached to the 1-celled ovary; pappus none; involucre of the heads bur-like or nut-like. Sterile or male flowers usually with an inconspicuous funnel-form or tubular 4–5 lobed corolla; stamens 5, separate or nearly so.

A small family of about 55 species, mostly native of America and many of them weeds. Formerly included with the Compositæ but, like the dandelions, now separated for convenience. Only 8 species, known commonly as ragweeds and cockleburs, are recorded from Indiana. Of these 4 are weeds of the first class.

114. Ambrosia trifidia L. Great Ragweed. Horse-weed. Giant Ragweed. Kinghead. (A. N. 1.)

Erect, branched, rough-hairy, 3–19 feet high; leaves opposite, stalked, deeply 3–5 lobed, lower often 1 foot wide; upper sometimes undivided,

sharply toothed. Sterile or male heads in racemes 3–10 inches long, their involucres saucer-shaped, 3-ribbed; receptacles naked; fertile heads 1–3 together in the axils of the upper leaves. Fruit top-shaped, ⅓ inch long, 5–7 ribbed and with 5–7 tubercles on the upper side. (Fig. 110.)

Abundant in alluvial or moist rich soil, often forming dense thickets along the borders of streams, roadsides and bottom fields. July–Oct. The name *Ambrosia* means "food for the gods." Why it was used as a generic name for the ragweed no one knoweth. The man who first used it may have had the equine god in mind, for horses are very fond of this species, often forsaking other food for its juicy leaves and branches. Among the poorer classes about the larger towns and cities quantities of it are gathered in August and September to be used instead of hay. Growing, as it mostly does, in lowlands, the seeds are scattered far and wide by overflowing waters. It is not a very aggressive weed and can usually be easily subdued by cultivation or by mowing or pulling before the flowers open.

Fig. 110. Leaf, flowering branch and seed. (After Dewey.)

As one walks or drives along streams or through low ground woodlands in early autumn he whiffs its peculiar odor which is exhaled readily, bounteously, to all comers. To some persons it is doubtless disagreeable, but to the writer it is rich, strong, powerful—fit odor for the gods. The plant itself is one of the largest of our annuals, often reaching, in rich alluvial soil, a height of 16 or more feet in a single season. Both it and the common ragweed harbor a small ash-gray, long-horned beetle (*Dectes spinosus* Say), the larvæ of which hibernate in their stems. On the horse-weed the beetle is usually to be found in June and July, resting in the angles between the leaves and stem.

115. AMBROSIA ARTEMISIÆFOLIA L. Ragweed. Roman Wormwood. Hog-weed. (A. I. 1.)

Erect, much branched, finely hairy, 1–5 feet high; leaves thin, mostly alternate, once or twice divided, the lobes oblong. Racemes of sterile heads numerous, 1–6 inches long, the receptacle chaffy. Fruit globular, armed with 4–6 short acute teeth or spines. (Figs. 6, *f*; 111.)

Probably the most common and widely distributed weed in the

State, occurring everywhere in both cultivated and pasture land, but especially abundant in stubble fields after the crops have been harvested. July–Oct. The slender racemes of little green staminate flowers, like knots or beads along the stem, produce a bounteous crop of yellow pollen which thickly coats the clothing of whoever passes through a clump of ragweed on an August day. Both it and the great ragweed are known as "hay-fever plants," their pollen spores when inhaled being popularly supposed to germinate in the nostrils and irritate the nasal membranes of persons subject to the disease. The seeds or fruit are common in clover seed and retain their vitality for years when buried in the soil, springing up wherever the land is plowed or after harvest when other plants are absent. Remedies: mowing or burning over stubble in September; early fall plowing followed by disk harrowing; use of clean seed; late cultivation in hoed crops; sheep grazing when the plants are young.

Fig. 111. *1*, a staminate flower; *2*, a fruit. (After Vasey.)

A prairie form, the lance-leaved ragweed (*A. bidentata* Michx.) occurs frequently in the western counties of the State. From the common form it differs in having the sterile heads sessile, not short-stalked, and in the leaves being lance-shaped, sessile, with one or two sharp teeth near the base.

116. XANTHIUM SPINOSUM L. Spiny Cocklebur. Dagger Cocklebur. Burweed. (A. I. 1.)

Stem erect, much branched, 1–3 feet high; leaves lanceolate, pointed, usually lobed or cut-toothed, shining,

Fig. 112. *a*, mature plant; *b*, branch showing spines and burs; *c*, bur; *d*, cross-section of bur showing 2 seeds. (After Dewey.)

dark green, whitish woolly beneath; axils each with a short-stalked, 3-pronged, yellow spine nearly 1 inch long. Bur oblong-cylindric, ½ inch long, hairy and with 1 or 2 short, awl-shaped beaks and numerous short hooked spines. (Fig. 112.)

This cocklebur has invaded Indiana from the south, where it is very troublesome, and is recorded from a number of the southern counties. Aug.–Oct. It is one of the most spiny of the American weeds, and the hooked spines on its burs provide for wide distribution by every passing animal. It is a native of tropical America and, unlike the other cockleburs, occurs mostly in grass-land, as pastures, meadows, and along roadsides, spreading even in strong sod. The two seeds in the thick-walled bur retain their vitality for years and care should be taken to destroy the first plants which appear before the burs mature. Remedies: mowing several times in late summer; deep cutting with hoe or spud in May and June; thorough cultivation for two or three successive seasons.

117. XANTHIUM GLABRATUM DC. Common Cocklebur. Clotbur. (A. N. 1.)

Erect, rough, branching, 1–6 feet high; leaves heart-shaped or ovate, long-stalked, the lower often 8 inches wide, margins toothed or lobed; axils without spines. Burs oblong, nearly glabrous, ¾ inch long, with 2 straight 2-toothed beaks and numerous smooth hooked spines. (Figs. 1, *c*; 113.)

Abundant everywhere in rich cultivated soils, barnyards, waste places and along roadsides. Aug.–Oct. One of the worst of corn-field weeds in river bottoms, and in pastures especially annoying in wool and the manes of horses. The burs with their two enclosed seeds are widely distributed over lowlands by annual overflows, and on the uplands by animals to which they closely adhere. It is said that only one of the 2 seeds will germinate the first season, the other lying dormant for a year. Another species, the American cocklebur or hedgehog burweed (*X. canadense* Mill.) is known from central Indiana and probably occurs over most of the State. It differs in having the burs somewhat hairy or glandular with the beaks hooked or incurved. Remedies: thorough cultivation; pulling before the burs are formed; burning mature plants before plowing.

Fig. 113. (After Dewey.)

The Thistle Family.—COMPOSITÆ.

Herbs, rarely shrubs, having the flowers in a close head on a common receptacle and surrounded by an involucre of few or many scales or bracts arranged in one or more rows; leaves varied in form and position; receptacle naked or with chaffy scales, smooth or pitted. Calyx tube of each flower firmly united to the ovary and usually bearing on its summit a pappus of bristles, awns, teeth or scales; corolla tubular, usually 5-lobed or 5-cleft, those of the marginal flowers often split to form a ray; stamens 5, borne on the corolla, their anthers united into a tube. Fruit an achene, consisting of the persistent wall of the calyx surrounding a single seed and usually crowned with some sort of a pappus. (Figs. 10, *g*; 11, *f*, *g*; 13, *b*.)

A vast family comprising, as above defined, not less than 10,000 species of wide geographic distribution. Since the asters form an important group, the members of the family are often called Asterworts. The name *Compositæ* is given to the family from the fact that its members have their small yet perfect flowers densely crowded together into a head, which is enclosed in an involucre or cup formed of several circles of modified leaves called "bracts;" this involucre performing the same protective function for the compound mass that the calyx or outer green envelop does for the ordinary separate flowers of other families. The object of this massing together of a great number of small flowers into a large head is that they may more easily and certainly attract the attention of insects and thus secure their fertilization. Taken singly, the flowers are too small and inconspicuous to attract separate attention, but by huddling themselves together into a showy mass they have proven themselves very successful plants; so much so, indeed, that the family is by far the largest known in the vegetable world.

About 205 species of wild Compositæ are known from Indiana, 194 being listed in Coulter's Catalogue. Among them, besides the weeds described below, are the blazing-stars, golden-rods, asters, everlastings, leaf-cups, rosin-weeds, cone-flowers, sunflowers, wormwoods, Indian plantains and ragworts. It is preëminently a family of weeds as, except from an aesthetic point of view, but three or four of the 200 species are of the least benefit to the inhabitants of the State. The few exceptions are used in medicines, a dose of boneset or yarrow tea being occasionally given by some grandmother or quack doctor for a fancied ailment. But the lover of nature, whose eye is ever on the search for the pleasing and the

beautiful, blesses the existence of these Compositæ, for the hues of the asters, golden-rods, sunflowers, etc., absent, our late summer and autumn scenery would lose much of the charm due to their variety of color.

Since the number of species of Indiana weeds in this family are so many they are divided into three groups, separated by the following simple key or table. This grouping is for convenience only, and necessitates the changing of the order of these weeds as they occur in the botanies.

KEY TO GROUPS OF INDIANA COMPOSITÆ WEEDS.

a. Heads without visible ray-flowers around the margins, the flowers rarely yellow, all discoid or tubular or the rays very rudimentary. Group A., p. 154.

aa. Heads with one or more rows of prominent ray-flowers about the margins, those of center all tubular.

b. Rays yellow. Group B., p. 168.

bb. Rays white, blue or pinkish. Group C., p. 175.

Group A.

To this group, having the flowers of the head all tubular, belong our weeds known as iron-weeds, bonesets or snake-roots, everlastings, wormwoods, fireweeds, burdock and thistles. With them are also included the horse-weed, fœtid marigold, tansy and two or three species of beggar-ticks or Spanish needles, which have the rays rudimentary or shorter than the disk flowers.

118. Vernonia fasciculata Michx. Western Iron-weed. (P. N. 1.)

Erect, branching, glabrous or sparingly hairy, 2–6 feet high; leaves thick, alternate, lanceolate, pointed, 3–6 inches long, sharply toothed. Heads numerous, short-stalked, 20–30 flowered; receptacle flat, naked; flowers reddish-purple; involucre bell-shaped, the bracts in several rows all closely overlapping. Achenes cylindric, glabrous, 8–10 ribbed; pappus of 2 rows of brownish bristles, the inner hair-like, the outer shorter, chaffy. (Fig. 114.)

Very common throughout the State in permanent grass-lands and along roadsides. July–Sept. One of the worst of pasture weeds, crowding out the blue-grass, and in places taking almost complete possession of the soil. The form above described is that most commonly found in dry soil in open upland wooded pastures. Associated with it in moist, rich bottom pastures are the tall iron-weed (*V. maxima* Small) 5–10 feet high and having the leaves thin, finely toothed, achenes hispid and inflorescence loosely branched and open; and the eastern iron-weed (*V. noveboracensis* L.), 3–12

feet high with the bracts of the involucre brownish-purple, tipped with spreading awns.

Fig. 114. Western Iron-weed.

The perennial roots of all these are stout and fibrous, and each autumn are filled with a sufficient supply of nourishment to give the stalk of the ensuing year a good start in life. They radiate in all directions from the base of the stem, spreading over an area of several square yards and penetrating the soil in search of moisture to such a depth as to render abortive any attempt of man to pull the plant up bodily, roots and all. The leaves are so innutritious that none of the higher animals, not even sheep, will feed upon them.

The only insect enemies of the iron-weeds, so far as noticed, are the margined and black blister beetles* which attack the leaves when other food is scarce, and a small gall-fly whose larvæ feed upon the juices of the flowering branches. They are also preyed upon at times by the leaf and downy mildews and by several rusts, but none of these serve to retard their growth to any great extent.

Many species of bumble-bees and butterflies visit the blossoms in search of nectar and pollen, and thus aid materially in their fertilization. The flowers in each head number, on the average, 25, each of which produces a single seed. On one specimen of medium size were counted 743 heads, so that 18,575 seeds, each capable of becoming a fully developed iron-weed, were borne by that plant alone, and the majority produce as many, or more. To secure a broad dissemination each of these seeds bears at maturity a tuft or pappus of light brown bristles, and by its aid the seed may be wafted by the wind miles away from the parent plant. Again, as the iron-weed grows in greatest luxuriance in the lowland pastures near small streams, many of the seeds fall upon the water and are borne onward till they lodge against some bank or are buried in the sediment deposited by an overflow; places well suited for their future growth. In these ways the weed is continually spreading

*_Epicauta marginata_ Fab. and _E. pennsylvanica_ DeG.

into pastures which have heretofore been entirely free from it. Taking into consideration that it is a native plant and therefore well suited to our soil; the character of its roots; the immense number of seeds produced; the modes of their dissemination, and its almost total exemption from the attacks of injurious insects, it is no wonder that it is so well able to hold its own in the struggle for existence, and also to increase in numbers from year to year. Remedies: mowing or hoe-cutting four times (in May, June, July and August) each season, thus preventing the leaves from storing nourishment in the roots; deep hoe-cutting and salting; thorough cultivation where practicable. The first remedy will, if kept up for two or three years, practically eradicate the weed.

It has been said that all things in nature have their use—that nothing exists but for a purpose. It is the work of science to discover and make known the use of nature's objects, and day by day her secrets are gradually being exposed, thereby advancing man in civilization by enabling him to better control the ravages of those existing forms which are injurious to his interests. If, however, the iron-weed has a use, other than that shown in the beauty of its flowers, no one has yet discovered it. But there is time, for of the thousands of plant forms which exist, we know the uses of only a few, as corn and hemp, ginseng and blood-root. Let us hope that some valuable medicinal or other property will soon be discovered in the iron-weed and a reason for its existence thereby pointed out to the doubting humanity of the present.

Meanwhile the naturalist will go on admiring the beauty of its bloom; for however coarse and repulsive the stem and leaves may appear, each head, with its 25 or 30 dainty florets so prettily grouped within their protective cup, reveals a striking beauty to the true lover of nature. And when in the glamour of an August morn he stands upon a hillside and views acre upon acre of the broad purple cymes waving in the valley beneath, all memories of the plant as a pernicious weed are blotted from his mind by the attractiveness of the scene before him.

119. EUPATORIUM PURPUREUM L. Jo-pye-weed. Trumpet-weed. Purple Boneset. (P. N. 3.)

Stem erect, simple or branched at top, green or purple, 3–12 feet high; leaves thin, in whorls of 3–6, oval or lanceolate, stalked, pointed, sharply toothed, 4–12 inches long. Heads numerous in a more or less elongated, branched cluster, 5–15 flowered; involucre cylindrical, the bracts pink, oblong, in 4 or 5 closely overlapping rows; flowers pinkish or reddish-purple. Achenes 5-angled. (Fig. 115.)

Common along fence-rows, borders of thickets, streams and lakes, especially in low moist grounds. July–Oct. The tall stem, whorled leaves and handsome heads of flowers make it one of the most conspicuous of our Compositæ. Both it and all the other bonesets may be distinguished from the iron-weeds by the pappus which is made up of a single row of rough, hair-like bristles, while in the iron-weeds the pappus is double, the inner row being of bristles and the outer of short scales. The purple boneset is not an aggressive weed, being seldom found in open pastures, and can be easily killed out by frequent mowing or deep cutting.

Fig. 115. Single flower on left; head of flowers on right. (After Britton and Brown.)

120. EUPATORIUM PERFOLIATUM L. Common Thoroughwort. Boneset. (P. N. 3.)

Stem stout, hairy, branched above, 2–5 feet high; leaves opposite, united at base and surrounding the stem, horizontal or half erect, lanceolate, long-pointed, finely toothed. Heads crowded in a flat-topped cluster, 10–16 flowered; involucre bell-shaped, the bracts lanceolate, pointed, in 2 or 3 overlapping rows; flowers white, rarely bluish. (Fig. 116.)

Fig. 116. *a*, mature head; *b*, fruit with pappus. (After Watson.)

Very common in low moist meadows, along ditches, borders of streams, lakes, etc. July–Sept. A well known weed, much used in the country as a remedy for fever and ague, whence the names "feverwort" and "ague-weed" by which it is sometimes known; also for colds, dyspepsia and as a tonic. The leaves and flowering tops are the parts used, and if gathered for sale should be stripped from the stalk when the latter is in flower and carefully dried. They bring from 2 to 8 cents per pound. When their infusion is taken in large doses it acts as an emetic and cathartic. When too abundant, the boneset can be killed out by drainage, frequent mowing, or thorough cultivation.

121. EUPATORIUM AGERATOIDES L. White Snake-root. White Sanicle. (P. N. 3.)

Erect, glabrous or nearly so, much branched, 1–4 feet high; leaves thin, opposite, broadly ovate, slender-stalked, pointed, coarsely and sharply toothed, 3–6 inches long. Heads numerous in loose clusters, 10–30 flowered; involucre bell-shaped, the bracts equal, linear, pointed, in 1 or 2 rows; flowers white.

Common in dense woods and thickets and along roadsides in shaded places, usually in rich moist soil. July–Oct. Supposed by many to be the cause of trembles in sheep, cattle and horses and of milk sickness in humans. While by most physicians and botanists this poisonous character is denied, Mr. E. L. Moseley has, by numerous experiments, recently proven* that it causes trembles and death when fed to cats, rabbits and lambs. He states that cattle and sheep will not touch the weed when other forage is plentiful, but that when turned into a closely cropped pasture or one covered with snow they eat it and are soon affected with trembles. The milk from cows which have eaten it under such conditions has been known to cause milk sickness and death. While the weed is not aggressive it should be cleared out of woods used for pasture. This can be done by drainage or by successive mowings. The root is used in medicines and, when properly prepared, brings 3 to 4 cents per pound.

Fig. 117. (After Watson.)

122. LEPTILON CANADENSE L. Horse-weed. Butterweed. Mare's Tail. (A. N. 1.)

Erect, bristly-hairy, usually much branched, very leafy, 1–8 feet high; lower and basal leaves spoon-shaped, stalked, cut-lobed; upper linear, entire. Heads small, very numerous, in an open panicle; receptacle naked; involucre bell-shaped, its bracts narrow in 2 or 3 overlapping rows; flowers dull white; rays numerous but shorter than the pappus and therefore inconspicuous. Achene flattened; pappus a single row of hair-like straw-colored bristles. (Fig. 117.)

Very common in fields, gardens and open waste places, especially in damp sandy soil. June–Oct. Occurs especially in old abandoned or fallow fields and in stubble. The seeds are very numerous, the

*Ohio Naturalist, VI, 1906, 463–470; 477–483.

stem stout and the root small. In size it varies much according to the richness of the soil. Widely distributed in Europe and South America in exchange for some of the many weeds they have furnished us. Remedies: pulling before the seeds ripen; mowing or burning in early autumn.

The horse-weed is used in medicine as a remedy for dropsy, diarrhea, etc. It is sometimes called "blood stanch," being used for stopping bleeding from wounds. The fresh herb when distilled yeilds a volatile oil known as oil of fleabane. When the plant is freely handled this sometimes causes a skin eruption, somewhat similar to that produced by poison ivy. The leaves and upper branches when gathered and dried during the flowering season bring from 6 to 8 cents per pound.

123. ANTENNARIA PLANTAGINIFOLIA L. Plantain-leaf Everlasting. Mouse-ear. Indian Tobacco. (P. N. 2.)

Low woolly herbs spreading by offshoots or runners and having the male and female heads on separate plants; stems of fertile plants 6–18 inches, of the sterile, 3–8 inches high; basal leaves in rosettes, woolly, broadly oval or spoon-shaped, 3-ribbed, dark green above, silvery white below; stem leaves linear or oblong, sessile. Heads numerous in small crowded clusters or short spikes; receptacle naked, pitted; involucre bell-shaped, its whitish scales in several overlapping rows; flowers all tubular, cream-colored. Achenes cylindric, slightly flattened. Pappus a single row of hair-like bristles, in the female flowers more copious and united at base.

Common in dry clayey, half-barren soil on the slopes of open upland woods and old fields. April–June. Spreading both by numerous seeds and runners, it forms broad patches, those of the sterile and fertile plants often separate, crowding out or taking the place of blue-grass and thus greatly lessening the pasture value of the land. It is one of the earliest of the Compositæ to blossom, often appearing the first of April. The flower stems are then very low, but like those of the dandelion soon arise to a foot or more in height. Remedies: increased fertilization and reseeding in pastures; cultivation and rotation with clover in old fields.

124. GNAPHALIUM OBTUSIFOLIUM L. Fragrant or Common Everlasting. Sweet Balsam. (A. N. 3.)

Stem erect, woolly, simple or branched, 1–3 feet high; leaves alternate, linear or lanceolate, tapering at base, sessile, pointed, dark green above, densely white woolly beneath, 1–3 inches long. Heads numerous, in panicled clusters of 2–5; receptacle flat, naked; involucre cone-shaped, its bracts dry, whitish, in several overlapping rows; flowers few, dull white. Achenes glabrous, oblong-cylindrical; pappus a single row of hair-like bristles. (Fig. 118.)

Common in dry soil on the slopes of open woodland pastures and old fields. July–Sept. A homely but very fragrant herb occupying waste places yet not aggressive enough to do much harm. Remedies: frequent mowing or pulling before the heads mature.

As one travels along the country roads or wanders through the woodlands from mid-July to October he inhales many an odor but none more pleasing than that which comes from this Compositæ. There is nothing like it in the rambler's category of smells. Once known it is never forgotten, and each season it is greeted with ever growing delight. If there is any other odor which it recalls it is that of the earth, earthy on the first days of the great awakening. Then the moistened leaves and mold give up from many a woodland surface the quintessence of herbs and grass and flowers long since dead and forgotten. But the odor of the everlasting is that of a living thing which one can gather and put into his pocket where for months it will exhale its fragrance. Where the plant is plentiful the odor penetrates the air for rods around and is often borne to the traveler by whom it is welcomed though its source be to him unknown. What combination of chemical atoms, what perfect union of C. and H. and O. and other elements, must there be for its production? What a hidden secret must this herb possess that it is enabled to produce and exhale such a unique, pleasing and life-inspiring fragrance!

Fig. 118. Pistillate flower on left; central one on right. (After Britton and Brown.)

125. BIDENS CONNATA Muhl. Swamp Beggar-ticks. (A. N. 1.)

Stems erect, purple, glabrous, usually much branched, 1–5 feet high; leaves thin, opposite, stalked, lanceolate or oblong, sharply and coarsely toothed, pointed, 2–5 inches long, the lower often 3-lobed. Heads numerous, erect, stalked, about 1 inch broad; involucre bell-shaped, its bracts in 2 rows, the outer ones the larger; receptacle flat, chaffy; rays none or 1–5 and inconspicuous; disk-flowers orange. Achenes wedge-shaped, flat, often keeled, edges bristly-hairy, top with 2–4 stiff downwardly barbed pappus-awns. (Fig. 1, *b*.)

Very common in swamps, borders of marshes and low wet bottom lands. July–Oct. This is one of 8 or 10 species of troublesome weeds occurring in the State and known as bur-marigolds, beggar-ticks, tick-seed sunflowers, pitch-forks, devil's bootjacks, etc. Some of them have prominent yellow rays and will be treated on

another page. All have the top of the achenes or seeds armed with strongly barbed bristles or awns by which they readily adhere to clothing, wool or hair of animals and thus are widely scattered. The awns are usually 2 in number, whence the generic name *Bidens*, meaning two-toothed. A closely allied species is the common beggar-ticks (*B. frondosa* L., Fig. 119), which is also very common in moist soil in fence corners, gardens, corn fields and waste places. It has the leaves 3–5 divided, the outer bracts larger and achenes wider with more slender awns. The juices sometimes cause an itching or skin irritation when the plant is handled. Both can be easily destroyed by mowing before the seeds ripen, thorough cultivation or improved drainage.

Fig. 119. (After Vasey)

126. BIDENS BIPINNATA L. Spanish Needles. (A. N. 2.)

Stem erect, 4-sided, branched, 1–5 feet high; leaves stalked, 1–3 times divided into oblong toothed or lobed segments. Heads numerous, long-stalked; involucre narrow, its bracts linear, the inner ones the larger; flowers few, dull yellow; rays none or 3–4, short, yellow. Achenes linear, 4-sided, ⅝ inch long, narrowed upward into a beak which bears 3 or 4 short downwardly barbed awns. (Fig. 120.)

Common in gardens, cultivated fields, borders of thickets and waste places, especially in rich moist soil. July–Oct. Remedies: pulling or mowing before the seeds ripen; burning over stubble fields and waste places in autumn.

Fig. 120. Long inner fruit with barbed awns; shorter and thicker outer fruit. (After Britton and Brown.)

127. BŒBERA PAPPOSA Vent. Fœtid Marigold. Yellow Dog-fennel. (A. N. 2.)

Erect, glandular, strong-scented, very leafy, much branched, 6–18 inches high; leaves opposite, sessile, divided into linear bristle-toothed or

cut-lobed segments. Heads numerous, short-stalked on the ends of the branches; involucre bell-shaped, its 8–10 oblong, purplish bracts in one row; receptacle flat, chaffy; rays few, short, inconspicuous; disk-flowers numerous, dull yellow. Achenes 4-angled, wider above, hairy, crowned by a ring of short hair-like brownish bristles. (Fig. 121.)

Fig. 121. Short ray-flower on left; disk-flower on right. (After Britton and Brown.)

Common along roadsides, banks of streams, railways and borders of fields, especially in gravelly or clayey soils. June–Oct. A migrant from the west brought in by railways and seeds in hay. Readily known by the large pellucid glands of the leaves and bracts which exhale a very disagreeable odor. In many places it seems to have taken the place of the common dog-fennel (*Anthemis cotula* L.). The odor of the latter was bad enough but that of the fœtid marigold is infinitely more disgusting. Remedies: mowing while in flower; cultivation, when practicable, of the land infested.

128. TANACETUM VULGARE L. Tansy. (P. I. 3.)

Stems stout, unbranched, 1–3 feet high; leaves twice divided into linear or oblong, cut-toothed segments. Heads numerous, small, in dense flat-topped terminal clusters; involucre saucer-shaped, its oblong bracts in several overlapping rows; receptacle flat, naked; flowers yellow, all tubular. Achenes angled and ribbed, with flat top and a crown or pappus of 5 short scales. (Fig. 122.)

Frequent in dense clusters along fence-rows, embankments, waysides, etc. July–Sept. An ill-smelling herb, formerly much cultivated in gardens but escaped and spreading in many places. Remedies: successive mowings or grubbing; cultivation.

Fig. 122. *a*, disk-flower; *b*, ray-flower; *c*, fruit. (After Watson.)

For sale the leaves and tops should be collected when in flower, and carefully dried. The infusion is bitter and acrid and is used as a stimulant, tonic, vermifuge, etc. When taken in overdoses the oil of tansy is poisonous. About 40,000 pounds are imported annually, the price ranging from 3 to 6 cents per pound. In England it was formerly thought that tansy laid to soak in buttermilk for nine days would "make the complexion very fair."

129. ARTEMISIA BIENNIS Willd. Wormwood. (A. or B. N. 2.)

Stem erect, very leafy, branched, 1–4 feet high; leaves alternate, once or twice divided into linear or oblong, toothed lobes. Heads small, numerous, sessile in dense axillary clusters or short spikes; involucre cup-shaped, its bracts green with dry margins; receptacle flat, naked; flowers tubular, greenish. Achenes small, slender; pappus none. (Fig. 123.)

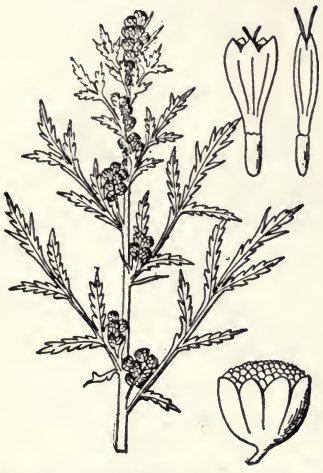


Fig. 123. Head of flowers below; single flowers above. (After Britton and Brown.)

Common along dry gravelly banks of streams, roadsides and waste places about cities and towns in southern Indiana; less so northward. July–Sept. It has a disagreeable, penetrating odor and a bitter taste. With us it is the most common of 6 or 7 species of so-called wormwoods, all of which are homely, weed-like plants. Remedies: pulling or grubbing; mowing several times before the heads mature.

130. ERECHTITES HIERACIFOLIA L. Fireweed. Pilewort. (A. N. 3.)

Stem erect, branching, grooved, succulent, 1–8 feet high; leaves thin, alternate, lanceolate or narrowly ovate, cut-toothed, 2–8 inches long. Heads rather large, in an open panicle at the ends of the branches; involucre cylindric, swollen at base, its bracts linear in one row; receptacle concave, naked; flowers white, all tubular. Achene linear-oblong, grooved; pappus a large tuft of smooth white hairs.

Frequent in rich moist soil along borders of woods and thickets. Very common in newly cleared ground, especially where brush-piles have been burned. July–Sept. In a deadening caused by fire this weed is the first plant to spring up, often taking complete possession of the soil for a year or two, then giving way to more hardy species. The foliage is often attacked by mildews and a small Carabid beetle (*Anisodactylus terminatus* Say) is sometimes found by scores feeding upon its ripening seeds. An ointment made from the essential oil is said to be a most excellent remedy for piles. It seldom occurs in cultivated fields and being an annual is easily controlled by mowing or pulling before the flowers appear.

131. ARCTIUM MINUS Schk. Common Burdock. (B. I. 1.)

Stem erect, grooved, fleshy, much branched, 1–5 feet high; leaves thin, alternate, broadly ovate, pale and somewhat woolly beneath, the lower often 15 inches long, their stalks hollow, grooved, margins wavy or toothed. Heads numerous in dense clusters; involucre ¾ inch broad, sub-

globose, its bracts glabrous, very numerous and tapering to long stiff points which become rigid and hooked at tip to form a bur, the inner ones erect and shorter than the flowers; receptacle flat, densely bristly; flowers purplish, all tubular. Achenes light brown, oblong, ribbed or 3-angled; pappus of short bristly scales. (Figs. 1, *d*; 124.)

Very common about the sites of old houses, barnyards, fence corners and waste places generally. July–Oct. A coarse, unsightly, ill-smelling social weed which has followed man over much of the continent, yet whose presence on any farm betokens a negligent and slovenly owner. It produces the first year of its growth only a rosette of large root leaves resembling those of the common "pie-plant," from the midst of which the flower-stalk of the next season springs. When ripe the whole flower head separates as a bur, which is very annoying in the wool of sheep and the manes of horses, and sticks closer than a brother to the clothes of man. These burs are almost ideal for seed distribution, the seed being widely scattered as the bur is carried along. Remedies: deep cutting below the crown with hoe or spud before flowering; burning the mature plants; repeated mowing.

Fig. 124. (After Clark.)

The seeds are very numerous, a large plant producing 400,000 or more, and when dried both they and the roots are used in blood and skin diseases and the fresh leaves as poultices for swellings and ulcers. The tap-root of burdock is large, fleshy, a foot or more long, and is sold under the name of lappa, the price ranging from 3 to 8 cents per pound. It should be collected in the fall of the first year, washed, split lengthwise and carefully dried. The seeds, if gathered when ripe or nearly so, have a value of 5 to 10 cents a pound.

132. CARDUUS LANCEOLATUS L. Common Thistle. Bull Thistle. (B. I. 1.)

Stem stout, branched, leafy to the heads, more or less woolly, 2–4 feet high; leaves dark green, lanceolate, pointed, deeply cut-lobed, the lobes and teeth tipped with stout prickles, the base and margins, which extend downward along the stem, bristly. Heads mostly solitary at the ends of the branches, about 2 inches long and when fully open almost as broad; bracts of the involucre in many overlapping rows, lanceolate, pointed, tipped with slender erect prickles; flowers dark purple. Achenes

gray, ribbed, ¼ inch long; pappus of several rows of slender hair-like white bristles. (Fig. 125.)

Very common in pastures, along roadsides, fence-rows and in old abandoned fields. June–Sept. One of the worst of pasture weeds, its long basal root-leaves of the first season spreading over and smothering out the blue-grass. The tap-root runs deep and the plant can be easily killed by cutting below its crown. This should be done in the late autumn or early spring with hoe or spud; repeated mowing before the seeds ripen is a less efficient remedy.

Fig. 125. *a*, piece of main stem with leaf; *b*, flower head; *c*, seed with pappus; *d*, seed with pappus detached. (After Dewey.)

Armed below with many a stiff spine and prickly involucral scale, the purple head of this thistle is itself more soft and yielding than velvet. To an eye which appreciates solid beauty the first thistle blossom of the year, opening from the apex of the central stalk, is one of the most attractive of our wild-wood flowers. Of what a number of cylindrical rays is it composed! How compactly and prettily are they grouped! What a soft and delicate expanse they unfold to view! The purple head is erect—a great eye, as it were, gazing up into the blue ethereal depths above— purple looking into blue—and mayhap gathering from the latter a deeper hue to add unto its loveliness.

This thistle is the national flower of Scotland, adopted, so the story goes, because it frustrated the capture of that country by the Danes a thousand years and more ago. While stealing upon a Scotch town after night, one of the Danes stepped on a thistle and cried out with pain. His cry awakened the Scots and saved their town. Beneath the Scottish emblem which bears the thistle there is often placed the motto: "No one injures me with impunity."

In England the thistle was also sacred to Thor the god of thunder, and was supposed to be colored by the lightning. To dream of being surrounded by it was considered a propitious sign, foretelling that the person so dreaming would soon receive some pleasing news.

133. CARDUUS ALTISSIMUS L. Tall Thistle. Roadside Thistle. (B. N. 2.)

Stem stout, branched, woolly, leafy to the heads, 3–10 feet high; leaves undivided, ovate-oblong or oblong-lanceolate, sessile, densely white woolly beneath, the margins with bristle-pointed teeth or cut-lobes, the lower 8–10 inches long, the upper narrower and smaller. Heads solitary at the ends of the branches, 2 inches wide; outer bracts of the involucre ovate, tipped with short spines and with a more or less prominent glandular spot along its middle, the inner bracts not spine-tipped; flowers light purple or pinkish. Achenes as in the preceding.

Frequent along roadsides and borders of thickets, pastures, etc., in moist rich soil. July–Oct. Usually taller and less branched than the common thistle. Associated with the tall thistle or growing in similar places is the field thistle (*C. discolor* Muhl.) having the leaves deeply divided into lanceolate or linear segments, the wool on their under side much thicker and the glands of the involucral scales larger. Both species are easily subdued by deep cutting or repeated mowing.

The glands on the bracts of these thistles exude a sticky substance which is very attractive to insects and which often serves to entrap and hold them until they perish. On different occasions in September the writer has found many dead flies, ants, harvestmen, small butterflies and small black snout beetles so held.* A large Scarabid beetle (*Euphoria sepulchralis* Fab.) is also very common at these glands. Though too big to be captured, it always appears dazed as if intoxicated by the secretion. Here and there on the stems numerous brown plant lice may often be seen, arranged in rows, their beaks deeply inserted in the grooves, their heads always towards the ground or base of the plant. The stem doubtless yields a sweetish sap agreeable to these aphids. In late autumn these tall thistles add a mite of color to many a woodland pasture, blooming as they do long after the more common thistles have ripened their achenes. One clump of these thistles was measured and found to be over 10 feet high, o'er-topping all the iron-weeds and the tallest of the actinomeris with which it grew.

134. CARDUUS ARVENSIS L. Canada Thistle. Creeping or Cursed Thistle. (P. I. 1.)

Stems slender, grooved, 1–3 feet high, branched above; leaves lanceolate or oblong, green both sides or somewhat downy beneath, sessile, deeply divided into very prickly lobed or toothed segments, the basal leaves 5–8 inches long. Heads small, 1 inch or less broad, very numerous; male and female heads on separate plants, the former globose, the latter smaller, oblong, bell-shaped with shorter corollas and more conspicuous pappus; outer bracts of involucre ovate, appressed, tipped with short,

*See "*Cnicus discolor* as an Insect Trap" in Can. Ent., 1892, 310.

prickly points, inner bracts longer, linear; flowers purple, pinkish or white. Achenes light brown, smooth, ⅛ inch long, tipped by a copious white pappus. (Fig. 126.)

Frequent in dense patches in northern Indiana in woodland and other pastures, old fields and waste places, and along roadsides; scarce or wanting in the southern counties. June–Oct. This thistle has gained the reputation of being one of the worst of weed scourges which Europe has furnished us, but in Indiana is less troublesome than the common thistle or fox-tail. Many other weeds, especially the teasel, tall thistle and bull nettle are mistaken for it. Usually it is first introduced into a new locality by the seeds, and then spreads rapidly wherever it can find a foothold. From other thistles it is best known by its deep running perennial rootstocks, more slender stems and small compact heads. (See Fig. 13, *b*.) From the rootstocks, which lie usually far below the ordinary depth of the furrows, branches are being continually sent to the surface, oftentimes through 3 feet and more of hard packed soil. These branches produce basal leaves the first year and flowering stems the second; these stems, like those of other thistles, appearing to die after their seeds ripen, but only dying down to the underground stem. Wherever it occurs the numerous branches and root-leaves soon cover the ground, smothering out the grass and preventing stock from grazing near them on account of their many prickles. Like other perennial herbs it can only be destroyed by starving out or otherwise killing the underground stems. Remedies: mowing or deep hoe-cutting three times each season, in June, August and September, then salting or applying coal-oil or sulphuric acid; repeated salting and sheep grazing for 2 years. In fields cut the thistles when in full bloom as close to the ground as possible, then plow deeply and sow to millet or Hungarian grass, seeding heavily and harrowing; in September cut the hay, plow again and seed with rye; the next May plow under the rye and plant to corn or some hoed crop. Short rotation and thorough cultivation of almost any crop with hoe will eventually eradicate the thistle.

Fig. 126. Showing horizontal roots, young shoots and mature plant in flower. (After Dewey.)

Group B.

Here belong those weeds among our Compositæ which have one or more rows of conspicuous yellow rays around the margin of the head of flowers. These ray-flowers are in most species pistillate and fertile, that is, producing seeds, though in some they are neutral and sterile. To the group belong our weeds known as golden-rods, elecampane, cup-plant, ox-eyes, cone-flowers, sunflowers, actinomeris, bur-marigolds and sneezeweed.

135. Solidago canadensis L. Canada Golden-rod. (P. N. 3.)

Stem stout, rough-hairy, 2–8 feet high; leaves alternate, lanceolate, rough above, 3-nerved, pointed, the lower ones sharply toothed and stalked, 3–6 inches long, the upper sessile, entire. Heads very numerous on one side of the spreading recurved branches of a large terminal panicle; involucre oblong, its linear appressed bracts in several overlapping rows; flowers bright yellow, the rays short, 9–15 in a single row. Achenes cylindrical, glabrous; pappus of numerous rough, hair-like bristles.

Abundant along fence-rows, roadsides and in old abandoned fields, especially in dry upland soil. Aug.–Nov. This is probably the most common and widely distributed of the 30 or more golden-rods recorded from the State. All are among the most handsome of our autumn wild flowers, being for the most part wand plants with small densely clustered yellow heads. For the botanist they form a difficult group, being separated mainly by the size of the heads, their arrangement in flower clusters, and by the texture and shape of the leaves. "Hardly has the 'last rose of summer' departed when the early golden-rod appears and its later sisters brighten even the November landscape. Simple, hardy, every-day flowers, they are full of sunshine and good cheer, adding brightness to the dusty wayside and joy to the common paths of life."

Fig. 127. Field golden-rod. (After Watson.)

Associated with the Canada golden-rod and more often found on old half sterile slopes is the field golden-rod (*S. nemoralis* Ait., Fig. 127.) 1–2 feet high, the stem and leaves thickly clothed with short ash-gray hairs, the lower leaves spoon-shaped and toothed, the upper oblong and entire; heads in a dense one-sided cluster, the flowers very

bright yellow with 5–9 rays. (Fig. 10, *g*.) Both species are too handsome to be called weeds, but if their room is needed they can be easily killed out by repeated mowing or by fertilization and cultivation of the soil.

136. EUTHAMIA GRAMINIFOLIA L. Swamp Golden-rod. Bushy or Fragrant Golden-rod. (P. N. 3.)

Stem erect, glabrous, much branched, 2–4 feet high; leaves numerous, linear-lanceolate, 3–5 nerved, pointed, the margins and nerves minutely rough-hairy. Heads small, numerous, sessile in a flat-topped terminal cyme or cluster; involucre club-shaped, its bracts oblong, appressed, overlapping, slightly viscid; flowers golden-yellow, the rays 12–20, disk-flowers 8–12. Achene top-shaped, velvety-hairy.

Very common in low moist grounds along borders of marshes and streams. July–Oct. From the golden-rods belonging to the genus *Solidago* this one is now separated by the rays being more numerous than the disk-flowers and by the receptacle being minutely fringed, not closely pitted as there. The flat-topped flower cluster and narrow leaves also distinguish it from most of the others. It spreads both by long running rootstocks and seeds and, if left undisturbed, soon forms large patches and becomes troublesome as a weed in damp hay meadows, being the most common of all golden-rods in low grounds. Since the roots are near the surface it can be easily destroyed by cultivation or shallow plowing and also by repeated mowings.

137. INULA HELENIUM L. Elecampane. Horseheal. (P. I. 3.)

Stems stout, tufted from large thick roots, simple or few branched, densely hairy above, 2–6 feet high; basal leaves broadly oblong, 10–20 inches long, 4–8 inches wide, long-stalked, rough above, woolly beneath; stem leaves smaller, ovate, alternate, sessile or clasping, pointed. Heads few or solitary, terminal, 2–4 inches broad; involucre saucer-shaped the bracts overlapping in several rows, the outer ones ovate, leaf-like; flowers yellow; rays numerous, linear, 3-toothed. Achenes 4-sided, $\frac{1}{8}$ inch long, glabrous; pappus of rough, hair-like bristles. (Fig. 128.)

Fig. 128. (After Millspaugh.)

Frequent in old fields, rich open woodlands, along roadsides and about old dwellings. June–Sept. Elecampane is a large, ungainly rough looking weed which was formerly grown for ornament or for medicine and has escaped in many places. It has been in use as a medicine

since the time of Hippocrates, the root being slightly aromatic, tonic and expectorant and at one time much used in dyspepsia and chronic coughs. When properly dried it brings 4 to 5 cents a pound. Remedies: deep and repeated cutting with hoe or spud.

138. SILPHIUM PERFOLIATUM L. Cup-plant. Indian-cup. (P. N. 3.)

Stem stout, 4-sided, branched above, 4–8 feet high; leaves opposite, thin, the upper entire, broadly united at base to form a cup-shaped cavity about the stem; lower long-stalked, cut-toothed, 6–15 inches long, 4–8 inches wide. Heads rather few, 2–3 inches wide, in a flat-topped open cluster; receptacle flat, chaffy; involucre saucer-shaped, the bracts broad, ovate; flowers yellow, the 20–30 rays linear, fertile, toothed; the disk-flowers pistillate but sterile, 5-toothed. Achenes broad, flattened, 2-winged, notched at top; pappus none. (Fig. 129.)

Fig. 129. Ray-flower and chaffy bract above. (After Britton and Brown.)

Common in low moist grounds along roadways, ditches, marshes, and especially banks of streams. July–Sept. A large coarse weed, the cups at base of leaves being a striking character. These are often filled with water in which many insects are drowned. Whether the weed is, like the pitcher plant, partly carnivorous, is as yet unknown. Remedies: deep cutting with hoe or spud.

139. HELIOPSIS SCABRA Dunal. Rough Ox-eye. False Sunflower. (P. N. 3.)

Stem rough, simple or branched above, 2–5 feet high; leaves opposite, ovate, pointed, sharply toothed, firm, rough on both sides, 2–5 inches long, 2 inches wide, short-stalked. Heads terminal, few or solitary, long-stalked, 2 inches broad; receptacle convex, chaffy; involucre cup-shaped, its bracts oblong, in 2 or 3 rows; flowers yellow, the rays 10 or more, fertile, 1 inch long. Achene thick, 4-angled; pappus crown-like of 1–3 sharp teeth. (Fig. 130.)

Fig. 130. Ray-flower, natural size; disk-flower and chaff. (After Britton and Brown.)

Common in dry soil along fencerows, borders of thickets, roadsides, etc. July–Sept. The name *Heliop-*

sis means "like the sun" and was given on account of the close resemblance to the sunflower from which the ox-eyes differ by having a more conical receptacle and by the withered ray-flowers being persistent upon the thicker, less flattened achenes, instead of falling off as in the sunflowers. The smooth ox-eye (*H. helianthoides* L.) is almost as common as the rough one and is found in similar places. It has the leaves smooth and the teeth of pappus dull or wanting. Remedies: repeated mowing or deep cutting; abandoning fence rows and cultivating the ground.

140. RUDBECKIA HIRTA L. Black-eyed Susan. Darkey-head. Yellow Daisy. (B. N. 2.)

Stem simple or sparingly branched, rough-hairy, often in tufts, 1–4 feet high; leaves thick, alternate, lanceolate or oblong, tapering, entire or few-toothed. Heads numerous, terminal, 2–4 inches broad, long-stalked; receptacle conic with linear chaffy scales; involucre cup-shaped, its bracts rough-hairy, spreading, much shorter than the rays; disk globose, its flowers brownish-purple; rays 10–20, orange. Achenes brown, 4-angled, 3/16 inch long; pappus none. (Fig. 131.)

Fig. 131. (After Clark.)

Common along streams, roadsides, fence-rows, borders of thickets, etc. June–Oct. Appears to be both an annual and a biennial; in the former case lower, more simple stemmed and blooming in late autumn; as a biennial, stouter, more branched and blossoming early. It is sometimes troublesome in hay fields, from which it may be removed by pulling, repeated mowing or thorough cultivation. In everybody's garden, along the gravelly banks of roadsides and streams, it is, however, most prevalent. There in July and August it is one of the most showy of our Compositæ and is a favorite with every one; for then the banks

"Are gay with golden-rod,
There blooming grasses nod,
And sunflowers small and yellow turn ever to the sun;
Quaint darkey-heads are there,
And daisies wild and fair,
In everybody's garden each flower's the loveliest one."

Two other "cone-flowers" belonging to the genus *Rudbeckia* are common enough to be called weeds, though they occupy for the most part waste land. They are the thin-leaved cone-flower (*R.*

triloba L.) having the stem branched, 2–5 feet high, the lower leaves deeply 3-lobed or 3-divided, the disk egg-shaped, dark purple, the rays 8–12, deep yellow or orange, and the tall or green-headed coneflower (*R. laciniata* L.) with the stem 3–12 feet high, the leaves divided into 3–7 toothed or lobed segments, the disk oblong-cylindric, greenish-yellow, and the rays, 6–10, bright yellow. The former grows in low moist meadows and the latter mostly in alluvial soil along the dense shaded banks of streams. Both are easily killed by repeated mowing or deep cutting.

141. HELIANTHUS DECAPETALUS L. Wild Sunflower. Thin-leaved Sunflower. (P. N. 3.)

Stem slender, glabrous, branched above, 2–5 feet high; leaves thin, ovate, pointed, sharply toothed, roughish above, the lower all opposite, slender-stalked, the upper alternate. Heads numerous, 2–3 inches broad; involucre cup-shaped, its bracts linear-lanceolate, pointed, spreading, often longer than the yellow disk; rays 8–15, light yellow. Achenes thick, somewhat flattened, glabrous; pappus of 2 awl-shaped awns.

Frequent along streams, borders of thickets, etc., in moist rich soil. July–Sept. This is probably the most common and widely distributed of the 16 species of wild sunflowers recorded from the State. All are weeds in that they grow uncultivated in waste places, yet no one of them is a weed of the first or even the second class. All agree in having conspicuous yellow rays which are neutral, that is, without pistils or stamens, in having the receptacle chaffy, the chaff arising from beneath the tubular disk-flowers, and in the pappus being represented by only 2 or 4 short scales or awns. The ray-flowers exist only for the purpose of attracting insects to the less showy fertile flowers of the disk, thus indicating a high type of division of labor in plant life. The leaves vary much in size, shape, position on the stem, smoothness, length of stalk, etc., and by these differences the species are mainly separated. In a few the disk-flowers are brown or purple and the receptacle flat, but in most kinds the disk is yellow and the receptacle convex. The generic name, *Helianthus,* means sunflower and probably refers to the popular belief that these flowers turn or change position on the stalk so as to face the sun most of the time. This belief is set forth by Thompson in the lines:

> "The lofty follower of the sun,
> Sad when he sets, shuts up her yellow leaves,
> Drooping all night, and, when he warm returns,
> Points her enamoured bosom to his ray."

And Moore, describing its faithful constancy, says:

"The sunflower turns on her god when he sets
The same look which she did when he rose."

Another reason for the name is that the flowers of the larger species have a fancied resemblance to the orb of day.

The two best known species of sunflower, both of which grow wild in Indiana, are the common sunflower (*H. annuus* L.) and the Jerusalem artichoke (*H. tuberosus* L.). The former is often cultivated in gardens where it sometimes reaches a height of 15 feet and a head diameter of a foot or more. "Its flowers yield honey and a yellow dye; its leaves fodder; its seeds an oil and food, and its stalks a textile fabric."* In some parts of the west and south it is a troublesome weed, but in Indiana the wild plants are escapes from cultivation. In the southeastern part of the State sunflowers are raised extensively for the seed, the average yield of the crop being 800 to 1,000 pounds per acre. Sulzer Bros. of Madison purchased in 1911, 100,000 pounds of the seed at 2 cents a pound. The seeds there grown are used mostly to feed cage birds, chickens, horses and other stock. In Russia and other European countries the seeds are grown on a much more extensive scale for their oil, which is expressed and used on the table like olive oil and also for lighting and soap making. The residual oil cakes have a high nutritive value and are used for feeding stock.

Fig. 132. Flowering branch, root and tubers; *a*, ray-flower; *b*, disk-flower; *c*, fruit. (After Watson.)

The Jerusalem artichoke or "earth apple," (Fig. 132), with its large rough lower opposite or upper alternate leaves, was extensively cultivated by the Indians for its oblong edible tubers which are offshoots from the fleshy thickened rootstocks. The plant is at present often grown for these tubers which are fed to stock or are pickled and used as a condiment. In many places in the State it grows rankly as a weed in alluvial or moist rich soil, reaching a height of 6–12 feet, and blooming 10 days or a fortnight later than its allies. Both it and other sunflowers, where too abundant, can be destroyed by cultivation, repeated mowing, or by deep cutting and free use of salt.

*Britton and Brown, III, 422.

142. VERBESINA ALTERNIFOLIA L. Winged Iron-weed. Yellow Iron-weed. Actinomeris. (P. N. 2.)

Stem slender, simple or branched near the top, winged by the downward extensions of the leaf margins, 4–9 feet high; leaves alternate or the lower opposite, oblong or lanceolate, pointed, toothed or entire, roughish both sides, sessile or short-stalked. Heads numerous in an open terminal cluster, 1–2 inches broad; receptacle convex, chaffy; involucre of a few lanceolate, deflexed bracts; disk globose, yellow; rays 2–10, yellow, drooping, 1 inch long. Achenes wedge-shaped, flattened, broadly winged; pappus of 2 diverging awns. (Fig. 133.)

Fig. 133. Winged fruit with awns; disk and ray-flowers on right. (After Britton and Brown.)

Common in the rich moist soil of lowland pastures and along the borders of streams. Aug.–Sept. Easily known by its winged stem, pale yellow rays, and loose arrangement of the achenes in the ripening heads. Spreading both by seeds and perennial roots, it often forms dense patches. The 30 or more loosely bunched disk-flowers are larger than those of most Compositæ and have an odor neither very strong nor pleasing, resembling somewhat that of the sunflower. It furnishes the yellow, the iron-weed the purple, and the everlasting the creamy white of a trinity of color which enlivens in August the lowlands of many a woodland pasture. Remedies: same as for iron-weed.

143. BIDENS LÆVIS L. Larger Bur-marigold. Brook Sunflower. (A. N. 2.)

Stem erect or ascending, glabrous, branched, 1–2 feet high; leaves opposite, sessile, lanceolate, toothed, pointed, sometimes united at base about the stem. Heads numerous, short-stalked, erect, 1–2 inches broad; involucre cup-shaped, its outer bracts linear or oblong, longer than the ovate inner ones; rays 8–10, showy, golden yellow, 1 inch long. Achenes wedge-shaped, both their margins and the 2–4 slender, stiff awns of pappus downwardly barbed.

Very common in low grounds about swamps, marshes, borders of brooks and ditches. July–Oct. Associated with it, almost as common and probably only a variety, is the smaller or nodding bur-marigold (*B. cernua* L.) having the heads nodding after flowering and the rays shorter, sometimes wanting. Both belong to the group having the achenes called "beggar-ticks" or "pitch-forks"

mentioned on a preceding page. These two species are notable for their yellow ray-flowers which in August often cover acres of lowlands with a flood of golden glory, but are succeeded in November by myriads of the 2-pronged seeds which clutch the clothing of the hunter for a free ride to pastures new. Remedies: mowing before the flowers open; drainage and thorough cultivation.

144. HELENIUM AUTUMNALE L. Sneezeweed. Swamp Sunflower. (P. N. 2.)

Stem rather stout, nearly smooth, narrowly winged, much branched above, 1–4 feet high; leaves alternate, oblong or lanceolate, pointed, narrowed to the sessile base, few-toothed, 2–5 inches long. Heads numerous, about 1 inch broad, long-stalked; receptacle convex, naked; involucre saucer-shaped, its bracts linear, reflexed, densely woolly; disk many-flowered, yellow, globose; rays 10–18, drooping, bright yellow, pistillate and fertile, 3–5 toothed or cleft. Achenes top-shaped, ribbed; pappus of 5–8 ovate pointed scales. (Fig. 134.)

Fig. 134. (After Chesnut.)

Common in low moist grass-lands, borders of fields, swamps, roadsides, etc. Aug.–Oct. One of the most handsome of our yellow-flowered Compositæ and, with the bur-marigolds and smartweed, competing for possession of many a swamp area. Remedies: drainage and cultivation; repeated mowings.

Sneezeweed, when dried and powdered, causes violent sneezing when inhaled and is sometimes used in medicine to produce that effect. The heads are often sprinkled with bitter aromatic globules and the whole plant is more or less acrid and poisonous, especially to cattle, sheep and horses, which often die after eating it in quantity. Its symptoms are said to be an accelerated pulse, difficult breathing, staggering, extreme sensitiveness to touch and, if fatal, spasms and convulsions.

GROUP C.

In this group of Compositæ weeds the one to several rows of rays around the margin of the head are usually white, though sometimes pinkish or bluish. Here belong the weeds known as asters, fleabanes or white-tops, yarrow, dog-fennel and ox-eye daisy.

145. ASTER SALICIFOLIUS Lam. Willow Aster. (P. N. 2.)

Stem erect, rather slender, very leafy, much branched, glabrous or hairy above, 2–5 feet high; leaves firm, alternate, lanceolate or willow-shaped, pointed, rough-margined, entire or few-toothed, sessile or slightly clasping. Heads numerous, ¾ inch broad, in loose terminal clusters; receptacle flat, pitted; involucre top-shaped, its bracts linear, green-tipped, appressed in 4 or 5 overlapping rows: disk-flowers many, yellow; rays numerous, bluish or violet, sometimes white, ½ inch long. Achenes flattened, minutely hairy; pappus of slender white bristles.

Very common in low annually overflowed bottom lands of the larger streams of the State, especially those which lie fallow for a season or two. Aug.–Oct. Associated with it in the lowlands, the two often forming a dense growth to the preclusion of other weeds, is a closely allied form, the tall white or panicled aster (*A. paniculatus* Lam.) with thinner smoother leaves and chiefly white rays. They are but two of the 30 species of asters recorded from the State, all of them being distinctively flowers of autumn. They begin blooming the last of August and as late as December 1st can often be found in some protected nook, the last wild flowers of the dying year. The ray-flowers of these wild asters are in a single row and fertile. In color they vary from a pure white to a deep blue; a few are of a pinkish hue, but none are red or yellow. The disk-flowers, however, are yellow, but turn purplish-brown or red with age, while the pappus is usually a single row of hair-like bristles. Those which live in woods and shaded places have broad and heart-shaped leaves while those of the fields and open places produce leaves that are slender or even awl-shaped. The name *Aster*, given them by Linnæus in 1753, means a star, the numerous rays giving them a star-like appearance. Longfellow refers to their naming in the following lines:

"Spake full well, in language quaint and olden,
One who dwelleth by the castled Rhine,
When he called the flowers, so blue and golden,
Stars, that in earth's firmament do shine."

He probably had in mind the New England aster (*A. novæ-angliæ* L.), one of our largest and most handsome species, which is also very common in moist open grounds. It grows 2–8 feet high, is rough-hairy and has very numerous lanceolate clasping leaves and heads 1–2 inches wide, each with 40 or more long violet purple rays. It occurs usually in large clumps, often along roadsides, and is a striking member of our autumn flora. All these lowland asters can be destroyed by repeated mowings or thorough cultivation.

146. ASTER ERICOIDES L. White Heath Aster. Frost-weed Aster. Steelweed. (P. N. 1.)

Stem glabrous, or (in the variety *pilosus*) rough-hairy, bushy or much branched, 1–3 feet high; leaves firm or rigid, the basal ones spoon-shaped, toothed, narrowed into margined stalks; upper ones linear-lanceolate, entire, gradually becoming short awl-shaped. Heads very numerous, ½ inch broad; involucre bell-shaped, its bracts linear, leathery, abruptly pointed, overlapping in about 3 rows; rays 15–25, white or pink tinged; disk often reddish-purple. (Fig. 135.)

Abundant in southern Indiana in dry soil, especially on the slopes of partly sterile or abandoned fields and pastures; less frequent northward. Sept.–Nov. Our most common upland aster, often taking complete possession of fallow fields, commons and old pastures and blooming until December 1st or later. The old stems are somewhat woody and the smaller branches and flowers are borne along one side of the larger ones. The hairy variety is more common than the type. Remedies: increased fertilization and thorough cultivation; crowding out with clover; sheep-grazing in pastures.

Fig. 135. Disk-flower and leaf. (After Britton and Brown.)

The heart-leaved or blue wood aster (*A. cordifolius* L.) is our next most common upland form, occurring in dry coarse soils along roadsides, fence rows and open woods. It has broad, rough, thin, heart-shaped, pointed, sharply toothed leaves and numerous small heads with 10–20 violet or blue rays. Remedies the same.

147. ERIGERON ANNUUS L. White-top. Daisy Fleabane. Sweet Scabious. (A. N. 1.)

Stem erect, branched above, clothed with spreading hairs, 2–5 feet high; leaves thin, lower and basal ones ovate or lanceolate, stalked, coarsely toothed, 2–6 inches long; upper ones oblong, lanceolate or linear, pointed, sharply toothed at middle or entire. Heads numerous, ½ inch broad, short-stalked; receptacle flat, hairy; involucre cup-shaped, its bracts narrow, in but one or two rows, nearly equal, rough-hairy; disk-flowers many, yellow; rays 40–70, in 2 or more rows, linear, white or purplish, pistillate. Achenes flattened; pappus double, the inner a row of slender fragile, tawny bristles which fall away, the outer of partly united slender scales. (Fig. 136.)

Very common in clover and timothy fields, along fence-rows and roadsides. May–Nov. Associated with it is the slender daisy flea-

bane (*E. ramosus* Walt.), distinguished by its smaller size, rougher or more hairy stem, narrower nearly entire leaves and smaller, longer rayed heads of flowers. Both are commonly known as "white-top" and are not separated by the average farmer. They are the most pernicious weeds with which the Indiana growers of timothy or clover have to contend; often occurring as winter annuals, producing a spreading tuft of coarsely toothed leaves from buried seeds in autumn, and blossoming the next May or early June. In clover fields these winter annuals are especially troublesome to the first crop, after the field has been in corn and grain for a year or two, being somewhat choked out by the heavier growth of succeeding years. In permanent timothy meadows many of the seeds ripen before the timothy is cut so that they are there a continuous nuisance. Remedies: cutting hay early before the white-top gets in full bloom; in timothy turning in a flock of sheep for a few days before mowing, as they eat the weed and leave the hay; if not too abundant, pulling from meadows while in blossom; examining the young clover fields in autumn, and if badly infested plowing up for wheat or for spring cultivation.

Fig. 136. (After Clark.)

The Philadelphia fleabane (*E. philadelphicus* L.) is quite common in low damp grass-lands in southern Indiana. It is a perennial, 1–3 feet high, its numerous heads with 100–150 long light rose-purple rays. Remedies: drainage and cultivation or repeated mowings. From the asters the fleabanes may be easily told by having the bracts in only 1 or 2 rows while the more slender ray-flowers are usually in 2 or more rows.

148. ACHILLEA MILLEFOLIUM L. Yarrow. Milfoil. (P. I. 2.)

Stem erect, simple or branched above, glabrous or somewhat hairy, 1–3 feet high; leaves alternate, all finely divided or dissected into narrow segments, those of the stem sessile. Heads small, numerous in a large compound flat-topped cluster; involucre egg-shaped, its bracts oblong, hairy, in a few overlapping rows; disk-flowers whitish, fertile; rays 4–6, white or pinkish. Achenes gray, wedge-shaped, about 1/12 inch long; pappus none. (Fig. 137.)

Common in old fields, meadows, pastures and along roadsides. June–Oct. An ill-smelling homely weed which thrives as well by the side of the road in a hard dry soil and dust-laden air as in

moist spots at the edges of ponds or lakes. The odor is strong and the taste sharp and bitter. When eaten by cows it imparts its taste and odor to milk and butter. Often troublesome in meadows but readily destroyed by pulling, repeated mowing while in blossom or thorough cultivation.

Fig. 137. Flowering branch with heads; *a*, head; *b*, disk-flower; *c*, ray-flower. (After Watson.)

In medicine it is used as a stimulant and tonic, especially for bladder troubles. The name *Achillea* is said to have been given the genus because Achilles used it in the Trojan war to heal the wounds of his soldiers. If gathered for sale the entire plant should be collected when in flower and carefully dried, the coarser stems being rejected. The price ranges from 2 to 5 cents a pound.

The common name milfoil refers to its finely cut leaves. As some clovers with three leaflets are trefoils and the five finger, cinquefoil, so the yarrow is milfoil or plant of a myriad leaflets. In England it is said to be used as a love charm by maidens who pluck the plant from the grave of a young man, meanwhile repeating the stanza:

> "Yarrow, sweet yarrow, the first that I have found,
> In the name of my beloved I pluck thee from the ground;
> As Jesus loved sweet Mary and took her for His dear,
> So in a dream this night I hope my true love will appear."

When carried about the person it was thought to drive away fear and was therefore worn in time of danger.

149. ANTHEMIS COTULA L. Dog-fennel. Mayweed. (A. I. 1.)

Stem much branched, glabrous, glandular, ill-smelling, 6–20 inches high; leaves two or three times divided into narrow, almost thread-like, pointed segments. Heads numerous, on long leafless stems at the ends of the branches; involucre cup-shaped, its bracts oblong, appressed, overlapping in several rows, their margins whitish; receptacle oblong, conical, chaffy at top, the chaff bristly; disk-flowers numerous, fertile, yellow; rays 10–18, white, neutral, 3-toothed, reflexed when old. Achenes top-shaped, dirty yellow, 1/12 inch long, usually with 8–10 lengthwise rows of wart-like tubercles; pappus none. (Fig. 138.)

Abundant in barnyards, lanes, commons of towns and along paths and roadsides. June–Nov. It is a vile, stinking, yet, with its

daisy-like heads, a handsome weed, flourishing for the most part in dry, much compacted soils along pasture pathways and in country barnyards where men and hogs and cattle are wont to travel or congregate. Cow-weed would be a more appropriate name than dog-weed or dog-fennel, for it grows best about those spots where kine gather and ruminate. The juice is acrid and often poisons the skin when the plant is freely handled. Each year it springs up and holds its own, starring the margins of the pathways with the yellow crowns and white rays. Scraping the mud from the swine which hurry past, trampled many times by slow-moving cows, though mud-bedaubed or broken in stem it succeeds in ripening its seeds and perpetuating its kind upon the face of earth. An alien from the byways of Europe, it triumphs where many of our native weeds would fail, mainly by its properties of perseverance and stubbornness of spirit. Its seeds are often found mixed with those of clover or grass. Remedies: mowing roadsides and barnyards twice each year before the flowers appear; in fields, mowing or burning the mature plants; clean seeding and thorough cultivation.

Fig. 138. (After Vasey.)

150. CHRYSANTHEMUM LEUCANTHEMUM L. Ox-eye Daisy. White Daisy. White-weed. (P. I. 1.)

Stems erect or ascending, simple or few branched, often several from a single root, 1–2 feet high; basal leaves oblong or spoon-shaped, coarsely toothed or cut-lobed, narrowed into slender stalks; stem leaves alternate, sessile or partly clasping, linear or oblong, deeply cut-toothed or entire. Heads few or solitary at the ends of the stem or branches, 1–2 inches broad, on long leafless stalks; receptacle flat, naked; involucre saucer-shaped, its bracts oblong, appressed, in several overlapping rows, their edges brownish; disk-flowers numerous, yellow, fertile; rays 20–30, white, spreading. Achenes gray or black, club-shaped, 1/12 inch long, angled or ribbed; pappus none. (Fig. 139.)

Common in southern Indiana in old meadows, fields and along roadsides, usually in poor dry upland soil; less frequent northward. May–Oct. One of the most handsome and popular of our Compositæ yet, where it gets a good start, one of the worst of weeds. In many of the eastern States it takes almost complete possession

of the pastures, rendering them quite white when the plant is in blossom. It spreads by the seeds, which are distributed in hay, manure, and various farm seeds, and also, when started in any spot, by short offshoots from the perennial rootstocks, which must be killed before the plant can be wholly eradicated. In meadows it is a rank and aggressive weed soon choking out the grasses, yet experiments have proven that as far as the chemical composition is concerned, the ox-eye daisy is fully the equal of timothy hay in food constituents. However, digestibility and the liking of live stock for it were not taken into account. Cutting the hay early and thus preventing the maturity of the daisy seeds is one of the best methods of clearing it out of meadows. At least 10 days are necessary after the blossoms open for the seeds to mature so that they will germinate. If the hay be cut during this period reseeding is prevented and many of the rootstocks die. As the plant is shallow-rooted, fields and meadows can be readily cleaned of it by plowing, thorough cultivation and short rotation of crops. In permanent pastures its eradication is a much more serious problem, about the only remedies being repeated mowings, or grazing closely with sheep. Farmers not now troubled with the weed should be on the especial look-out for it, and isolated plants which appear in a new place should be quickly dug or pulled.

Fig. 139. (After Shaw.)

On account of its beauty the ox-eye daisy is often cultivated by florists and is much used in boquets and for decorations. Instances are on record where its spread has been traced to the throwing away of wilted flowers in which the seeds were almost ripe. With its conspicuous white rays to attract from far and wide bees and other insects to aid in the fertilization of its numerous and closely packed disk-flowers it is one of the highest of plants. The asters, the fleabanes, the dog-fennel and the ox-eye daisy, all have the ray-flowers thus differing in hue from the central florets and, as Grant Allen has well said, form a group "of the commonest, most numerous and most successful of plants. They really stand to all other plants in the same relation as man stands toward other animals." It is well fitting, therefore, that this weed book should end with these, the highest and most successful of weeds among the great kingdom of plants.

A List of the More Important Books and Papers Used in the Preparation of This Weed Book.

ATKINSON, GEO. F.—"A College Text Book of Botany."—1905.

BLATCHLEY, W. S.—"A Catalogue of the Uncultivated Ferns and Flowering Plants of Vigo Co., Ind."—From the 21st Ann. Rep. Ind. Dept. Geol. and Nat. Resources, 1896.

BRITTON, N. L. & BROWN, ADDISON.—"An Illustrated Flora of the Northern United States and Canada."—1896–1898.

CHESNUT, V. K.—"Thirty Poisonous Plants of the United States."—Farm. Bull. No. 86, U. S. Dept. Agr., 1898.

CLARK, GEO. H. and FLETCHER, JAS.—"Farm Weeds of Canada."—1906.

CLARK, GEO. H.—"Report of the Seed Commissioner of the Dominion of Canada."—1911.

COULTER, JOHN M.—"Plant Structures."—1900.

COULTER, STANLEY.—"A Catalogue of the Flowering Plants and of the Ferns and their Allies Indigenous to Indiana."—From the 24th Ann. Rep. Ind. Dept. Geol. and Nat. Resources, 1899.

DARLINGTON, WM.—"Agricultural Botany."—1847.

DEWEY, L. H.—"Weeds and How to Kill Them."—Farm. Bull. No. 28, U. S. Dept. Agr., 1905.

GRAY, ASA.—"Manual of the Botany of the Northern United States."—Sixth Edition, 1889.

HALSTED, BYRON D.—"Preliminary List of the Weeds of Iowa."—Bull. Bot. Dept. State Agr. Coll., Ames, Ia., 1888.

HENKEL, ALICE.—"Weeds Used in Medicine."—Farm. Bull. No. 188, U. S. Dept. Agr., 1904.

MACMILLAN, CONWAY.—"Minnesota Plant Life."—1899.

SELBY, A. D.—"A Second Ohio Weed Manual."—Bull. 175, Ohio Agr. Exp. Sta., 1906.

SHAW, THOS.—"Weeds and How to Eradicate Them."—1911.

VASEY, GEO.—"Weeds of Agriculture."—Reps. of Botanist *in* Reps. U. S. Comm. of Agr., 1886, '87, '88.

Glossary of Terms Used in Text.

Achene.—A one-seeded fruit having the wall of the seed-vessel tightly fitting around the seed.
Acute.—Sharp pointed.
Acuminate.—Gradually tapering to a point.
Alternate.—See p. 34.
Anther.—The pollen-bearing part of the stamen.
Apetalous.—Without petals.
Appressed.—Lying closely against the stem or other organ.
Ascending.—See. p. 33.
Awn.—A slender bristle-like organ.
Axil.—The angle where the leaf meets the stem.
Axillary.—Borne in an axil.

Biennial.—See p. 18.
Berry.—See p. 41.
Bract.—A small leaf which surrounds or protects a flower.
Bulb.—An underground bud with fleshy scales.
Bulbous.—Bearing bulbs; springing from a bulb.

Calyx.—See p. 35.
Capsule.—See p. 42.
Carpel.—A modified leaf which forms part or all of an ovary.
Caryopsis.—See p. 42.
Chaff.—Thin dry scales.
Chlorophyll.—The green coloring matter of plants.
Cleft.—Cut about half way to midrib.
Cordate.—Heart-shaped.
Corolla.—See p. 36.
Corymb.—See p. 40.
Cotyledon.—A rudimentary leaf of the embryo.
Crenate.—Scalloped; with rounded teeth.
Culm.—The stem of grasses and sedges.
Cyme.—See p. 41.

Decumbent.—Having the base prostrate, the apex rising.
Decurrent.—See p. 35.
Deflexed.—Turned abruptly downward.
Dehiscent.—Opening to emit the contents.
Dentate.—Toothed.
Diffuse.—Loosely spreading.
Diœcious.—See p. 38.
Discoid.—Composed only of tubular flowers.
Disk.—The head of tubular flowers in Compositæ.
Dissected.—Divided into many segments or lobes.
Distinct.—All separate, one from another.

Divided.—Cleft to the midrib; compound.
Drupe.—See p. 41.

Embryo.—A rudimentary plant in the seed.
Endogen.—See pp. 32, 44.
Exogen.—See pp. 33, 44.
Exserted.—Protruding out of, as the stamens out of the corolla.

Fertile.—Bearing seed.
Fertilization.—The mingling of the contents of a male and female cell; application of plant food to soils.
Filament.—The stalk of an anther.
Follicle.—See p. 42.
Free.—Separate from all other organs or parts.
Fruit.—See p. 41.

Gamopetalous.—Having the petals more or less united.
Glabrous.—Devoid of hairs.
Gland.—A cell or group of cells which exudes a liquid.
Globose.—Spherical or nearly so.
Glume.—The scaly bracts of the spikelets of grasses and sedges.

Hastate.—Arrow-shaped with the basal lobes extending straight outward.
Head.—See. p. 40.
Herb.—See p. 32.
Herbaceous.—Leaf-like; herb-like.

Imperfect.—Flowers with either stamens or pistils, not with both.
Indehiscent.—Not opening.
Inferior.—See p. 39.
Inflexed.—Bent abruptly inward.
Inflorescence.—The mode of arrangement of flowers on the stem.
Involucre.—A circle of bracts beneath a flower or flower cluster.
Irregular.—A flower in which one or more of the petals or sepals are unlike the others.

Lanceolate.—Much longer than broad and tapering to a point; lance-shaped.
Leaflet.—One of the divisions of a compound leaf.
Legume.—A pod; a simple dry fruit, splitting along both sides.
Lens-shaped.—Having both sides curved; or with the form of a double convex lens.
Linear.—Elongate and narrow with sides nearly parallel.
Lobed.—Deeply cleft or divided.
Loment.—A jointed pod, constricted between the seeds.

Midrib.—The central vein or rib of a leaf.
Monodelphous.—United in one set.
Monœcious.—Having the stamens and pistils in different flowers on the same plant.

Naked.—Lacking both calyx and corolla.
Nut.—A one-seeded fruit with a hard shell which does not split when ripe.

Oblong.—Longer than broad with the sides nearly parallel.
Obovate.—Ovate with the broad end outward; inversely ovate.
Obtuse.—Blunt or rounded.
Orbicular.—Nearly circular in outline.
Ovary.—See p. 39.
Ovate.—Egg-shaped.
Ovoid.—Same as ovate.
Ovule.—A minute or unripe seed.

Panicle.—See p. 41.
Panicled.—Arranged in a panicle.
Pappus.—The bristles, awns, teeth, etc., borne on the tops of the achenes of Compositæ and aiding in their distribution.
Parasitic.—Growing upon other plants and absorbing nourishment therefrom.
Parted.—Deeply cleft.
Peduncle.—The stalk of a flower.
Pellucid.—Admitting the passage of light; translucent.
Perfect.—Flowers with both stamens and pistils.
Perianth.—Having the calyx and corolla so similar as not to be readily distinguished.
Persistent.—Remaining on the plant until withered or after growth has ceased.
Petal.—One of the parts of the corolla.
Petiole.—The stalk of a leaf.
Pinnate.—Leaves divided into leaflets along a common axis.
Pistil.—See p. 38.
Pistillate.—Possessing pistils.
Plumose.—Feather-like.
Pollen.—The male fertilizing grains borne by the stamens.
Polypetalous.—With separate petals.
Pubescent.—Bearing hairs.
Punctate.—Marked with translucent dots.

Raceme.—See p. 40.
Ray.—The flat strap-shaped corolla of a Compositæ flower.
Receptacle.—The end of the flower stalk bearing the floral organs or flowers.
Recurved.—Curved backwards.
Rootstock.—An underground stem with buds.
Rosette.—One or more circles of leaves lying flat on the ground.
Rugose.—Wrinkled.

Sac.—A pouch or cavity as of anthers or embryo.
Scale.—A minute leaf.
Scalloped.—With rounded teeth.
Sensitive.—Closing or folding when touched.
Sepal.—One of the parts of the calyx.
Sessile.—Without a stalk.
Silique.—See p. 42.
Spike.—An elongated cluster of sessile blossoms.

Spikelet.—A little spike.
Spreading.—Nearly prostrate on the ground.
Stamen.—See. p. 37.
Sterile.—Without seeds or spores.
Stigma.—See p. 39.
Stipules.—Appendages borne at the base of the leaf stalk.
Stipulate.—Bearing stipules.
Style.—The narrowed top of the ovary.
Succulent.—Soft and juicy; fleshy.
Superior.—Said of the ovary when free from calyx.
Suture.—A line of splitting or opening.

Terminal.—Borne on the end of the stem or branch.
Terete.—Circular in cross section.
Truncate.—Cut square off.
Tuber.—A short thick underground stem.
Tubercle.—A wart-like grain or projection.

Umbel.—See p. 41.
Umbellet.—A small or secondary umbel.
Utricle.—An achene or one-seeded fruit with a loose outer covering.

Whorl.—A circle of three or more leaves or other organs arising from the same level.
Wing.—A thin expansion of a seed or stem.

Index.

	Page
Actinomeris	174
Amaranth Family, weeds of	72
Annual weeds	17
Artichoke, Jerusalem	173
Aster	176
Barley, wild	57
Barnyard grass	52
Beard-grass	51
Beggars' lice	113
Beggar-ticks	160
Bell-flower Family, weeds of	140
Biennial weeds	18
Bindweed, black	68
bracted	108
Birds as weed-seed destroyers	25
Bitter-sweet	127
Blackberry, wild	86
Black-eyed Susan	171
Blue bur	114
Blueweed	115
Boneset	156
Borage Family, weeds of	112
Bouncing-bet	79
Brier, common	86
Broom-sedge	51
Buckhorn	137
Buckwheat, climbing false	68
wild	68
Buckwheat Family, weeds of	63
Buffalo-bur	126
Bull-nettle	125
Burdock	163
Bur-grass	54
Burseed	114
Butter and eggs	131
Buttercup Family, weeds of	80
Butterfly-weed	105
Butterweed	158
Canada thistle	166
Carpet-weed	76
Carrot Family, weeds of	100
Carrot, wild	101
Catchfly, night-flowering	79
sleepy	78
Catnip	118
Charlock	83

Page
Cheat 55
Chess 55
Chickweed, common 80
Chicory 143
Cinquefoil, common 87
rough 88
Cocklebur 151, 152
Cockle 78, 79
Cone-flower, green-headed 172
thin-leaved 171
Corn gromwell 114
Couch-grass 56
Cowbane, spotted 103
Cow parsnip 102
Crab-grass 52
Crowfoot Family, weeds of 80
Cup-plant 170
Dandelion 144
Darkey-head 171
Dead-nettle 121
Dock 64
Dodder Family, weeds of 110
Dogbane Family, weeds of 104
Dog-fennel 161, 179
Elecampane 169
Evening primrose, common 99
Everlasting, fragrant or common 159
plantain-leaf 159
Families of weeds, keys to 43, 45, 47
Figwort Family, weeds of 129
Finger-grass 52
Fireweed 163
Five-finger 87
Fleabane 177, 178
Flowers of weeds 35
Foxtail, green 54
yellow 53
Fruits of weeds 41
Galingale 58
Garlic, wild 60
Germander, American 118
Golden-rod 168
Goose-grass 67
Goosefoot Family, weeds of 69
Grass Family, weeds of 50
Ground-cherry 124
Ground ivy 119
Hawkweed 148
Hedge nettle 121
Hemlock, poison 103

Page
Henbit 121
Hogweed 150
Horse nettle 125
Horseweed 149, 158
Hound's-tongue 113
Indiana weeds, classes of 12
origin of 11
Indian mallow 97
tobacco 141, 159
Inflorescence of weeds 40
Iron-weed 154, 174
Ivy, poison 94
Jimson-weed 128
Jo-pye-weed 156
Keys to Families of weeds 43, 45, 47
Knot-grass 67
Lady's thumb 65
Lamb's quarters 69
Leaves of weeds 33
Lettuce, prickly 146
wild 148
Lily Family, weeds of 60
Lobelia, great 141
Mallow Family, weeds of 95
Man-of-the-earth 108
Marigold, bur 174
fœtid 161
Mayweed 179
Meadow-grass, pungent 55
Medic, hop 89
Medicinal properties of weeds 28
Mercury, three-seeded 92
Mexican tea 70
Milfoil 178
Milkweed Family, weeds of 105
Mint Family, weeds of 117
Morning-glory Family, weeds of 107
Motherwort 120
Mullen, common 129
moth 131
Mustard Family, weeds of 81
Mustard 82, 84
Nettle Family, weeds of 61
Nettle, bull 125
hedge 121
horse 125
slender 62
Texas 126
Nightshade 127
Nut-grass, yellow 58

Page
Old-witch grass 53
Onion, wild 60
Orache 71
Origin of Indiana weeds 11
Ox-eye 170
Ox-eye daisy 180
Parsley Family, weeds of 100
Parsnip, wild 102
Partridge pea 89
Pea Family, weeds of 88
Pennyroyal 122
Pepper-grass, wild 82
Peppermint 123
Perennial weeds 19
Persicary, glandular 65
Pigeon-berry 75
-grass 53
-weed 114
Pigweed Family, weeds of 72
Pilewort 132, 163
Pink Family, weeds of 77
Plantain Family, weeds of 135
Pleurisy-root 105
Poison hemlock 103
ivy 94
sumac 95
Pokeweed 75
Potato Family, weeds of 124
Prickly potato 126
Prickly sida 96
Primrose, evening 99
Purslane 77, 92
Quack-grass 56
Queen Anne's lace 101
Ragweed Family, weeds of 149
Red-root 73
Rib-grass 137
Ribwort 137
Roots of weeds 31
Rose Family, weeds of 85
Rush Family, weeds of 59
Russian thistle 71
Sand-brier 125
-bur 54
Sedge Family, weeds of 57
Senna, wild 88
Shepherd's purse 84
Silkweed 107
Smartweed 66
Snake-root, white 158

Page
Sneezeweed 175
Soapwort 79
Sorrel, field 63
Sow-thistle 145
Spanish needles 161
Spearmint 123
Speedwell 133
Spraying for weeds 24
Spurge Family, weeds of 91
Squirrel-tail grass 57
Steel-weed 177
Stickseed, Virginia 113
Stinking-grass 55
St. John's-wort Family, weeds of 98
Sumac Family, weeds of 94
Sunflower, common 173
wild 172
Sweet clover 90
Sweet potato, wild 108
Tansy 162
Tear-thumb, arrow-leaved 69
Teasel 139
Thistle, Canada 166
common 164
Thistle Family, weeds of 153
Thorn apple 128
Thoroughwort 157
Tick-trefoil, hoary 90
Toad-flax 131
Tongue-grass 82
Trumpet creeper 134
Tumble-weed 53, 74
Velvet leaf 97
Venus' looking glass 140
Vervain Family, weeds of 115
Water hemlock 103
Water-pepper 66
Weed, definitions of 6
Weed extermination, rules for 20
seeds, distribution of 7
Weeds, losses caused by 13
of cities and towns 16
used in medicine 29
Wheat thief 114
White-top 177
Wire-grass 59
Wood sage 118
Wormseed 70
Wormwood 163
Yarrow 178

NATURE BOOKS BY W. S. BLATCHLEY

I. "GLEANINGS FROM NATURE."

Special studies on the insects, fishes, reptiles, birds and plants of Indiana and adjoining States. Some of the chapter headings are:

Harbingers of Spring.
Two Fops Among the Fishes.
Mid-Summer Along the Old Canal.
Ten Indiana Caves and the Animals which Inhabit Them.
Katydids and Their Kin.
Snakes and Their Habits.
Twelve Winter Birds.
How Plants and Animals Spend the Winter.

"This book can be highly recommended for its honesty and directness of purpose. The essays are truthful and give vivid touches of nature, the results of close and sympathetic observation."—*Dr. D. S. Jordan, in American Naturalist.*

"A true outdoor book, well designed to increase the pleasure and interest of an outing."—*F. M. Chapman, in Bird-Lore.*

Silk cloth, 348 pp., 15 pls., 100 illustrations. $1.25, postpaid.

II. "A NATURE WOOING AT ORMOND BY THE SEA."

The only book treating of the natural history of the East Coast of Florida. Contains lists of the insects taken at Ormond, Fla., in March and April, with many notes on birds, insects, reptiles, shell mounds, etc.

"The author is a true naturalist, and chapters written by a man of this kind are worth reading. The book is beautifully illustrated and is well gotten up in every way."—*Recreation.*

Silk cloth, 245 pp., 12 pls., 63 illustrations, map. $1.10, postpaid.

III. "BOULDER REVERIES."

A series of sketches on the wild life of an old woods pasture in Western Indiana. It breathes of nature on every page.

"A book delightful in its simplicity, which will address a strong appeal to all lovers of Nature."—*Indianapolis News.*

"It has given me many an hour of restful and uplifting pleasure."—*Hon. Albert J. Beveridge.*

Silk cloth, 230 pp., 10 pls. $1.10, postpaid.

IV. "WOODLAND IDYLS."

The newest and best of Blatchley's nature books. An appeal for the simple life, written in the midst of nature, where only that life can be lived. A book for all who love the great out-of-doors, and especially for camp-lovers, bird-lovers, botanists and fishermen. The following are a few of the page headings:

Odors of August.
A Woodland Optimist.
Simplers and Herbalists.
The Earth's Mold Blanket.
A Floral Calendar.
Fisherman's Luck.
Old Clothes in the Woods.
Fire Pinks and Humming Birds.
How Herons Hunt.
Evening Wood-Sprites.

"A better book than this as a pocket companion for the camper can hardly be found, for it will sharpen his wits to a multitude of little things about him, and will introduce him to phases of nature that will be right at hand, no matter where he pitches his tent."—*Indianapolis News.*

"I have enjoyed it to the very utmost. It takes me back to the old days amidst Nature's sweet and refreshing environment, for which there is no substitute in this world."—*Hon. Chas. W. Fairbanks.*

Silk cloth, 242 pp., 3 pls. $1.25, postpaid. All 4 for $4.00, or "Woodland Idyls" and either "Boulder Reveries" or "A Nature Wooing" for $2.00.

THE NATURE PUBLISHING CO.,
1558 Park Avenue, Indianapolis, Ind.

456266